THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., JANUARY 15, 1891.

THE WEEK IN IRON CIRCLES

General Features.

The iron market is not without features of interest. While buying is not active or general, there is, nevertheless, a great improvement over the past few weeks. Naturally, much irregularity is shown in transactions. Some furnaces, both North and South, have accepted very low figures, in order to turn stock on hand into much needed money. The almost complete suspension of business during December tended to reduce stocks in consumers' yards to a minimum and increase stocks at furnaces. For the latter reason the wholesale blowing out of stacks in Alabama, in December, has not had the prompt effect on the market that was expected. How long it will be before this restriction of output will bring about a reaction will depend much upon the extent of demand from consumers, which the new year will develop. Nearly two-thirds of the furnaces in the Birmingham district proper are either banked or blown out. Those which are banked on account of the strike would not start again if the strike were terminated, unless prices were improved. A somewhat extended inquiry among foundry and rolling mills reveals a hopeful spirit and a fair degree of activity all around. The market at Louisville is very unsettled, prices being less firm than they were last week, sales being reported for deliveries during five and six months at less than $10.00 for gray forge. There is considerable interest in the South as to the outcome of the wholesale blowing out of furnaces in the Mahoning and Shenango valleys; the general opinion being that it will favorably affect Southern iron. To such an extent is this believed that some Southern furnaces have been advised to not offer iron there on the present basis, but to wait a few days when more can be realized. There were a number of parties in the market for round lots of iron, but they have decided to hold off for a short time, until they can see clearly about the demand for finished products. One of the large Southern rolling mills is reported to have bought about 4,000 tons of mottled and gray forge, deliverable from March to September, at a price basis of $9.75, Birmingham. At Chicago the year started in showing considerable buying, sales ranging from 500 tons upward, many of the largest consumers in the district having depleted their stocks, and realizing that prices are not likely to range much lower. The iron sold has been largely Southern and Northern coke brands, the latter covering a heavy percentage of tonnage booked. Prices have ranged low, in some cases special figures have been made for quick deliveries and prompt payment. The outlook indicates a fair-sized buying movement during next 30 to 60 days, with prices ranging on about present basis. It is now recognized that production has been largely cut down by the blowing out and banking of furnaces both North and South; on the other hand a curtailment in consumption is also being felt. Another dull week is reported at Detroit, but a certain degree of interest seems to have been taken by the buyers, to the extent at least of inquiry and some actual transactions, although of not large volume. Lake Superior charcoal is absolutely motionless. We have heard of no transactions whatever beyond a few car loads. The St. Louis market is devoid of any interesting features. Consumers, generally, in that section, have bought for deliveries extending into this year, and are awaiting developments before making further purchases. Some signs of strength have been noticeable in the Eastern iron market since the shutting down of furnaces in the South and the Shenango and Hocking valleys. There is considerable talk in the East, however, of a shut down there. It is proposed to make a general movement against the coke producers by the shut down, and force them to accept lower prices. The coke men have proposed a sliding scale based on the price of iron, but this is not satisfactory to the Eastern furnace men. There are some serious phases about the question, but the generally good outlook for business promises that all signs of trouble will vanish in an era of prosperity before midsummer. The financial situation still continues to be a matter of some anxiety. Secretary Windom is authority for the statement that the growing Treasury surplus cannot now be used in the purchase of four per cent. bonds, for the reason that it will be needed to meet pension payments, due next month, aggregating $25,000,000. The available cash surplus is now $18,000,000, but by continued excess of receipts over expenditures will probably reach the required amount by the time indicated. Secretary Windom is of opinion that the business of the country will be improved by making these pension payments monthly instead of quarterly, as at present, and he has made a recommendation to that effect to the proper Congressional committees. If this is done, he says, it will do away with the present necessity of keeping a large sum of money in the Treasury vaults for three months, when it might just as well be in the hands of the people entitled to it. On the encouraging side of the picture may be mentioned our steady growth, especially in the South, the annual value of whose agricultural and manufactured products is now estimated at $2,000,000,000 a year.

The Local Situation.

The market affords little that is not already known and the news of which has not long been discounted. The action of the combined Valley furnaces, for instance, that went out of blast last Saturday on schedule time, was well known these six weeks, and was anticipated in these columns that length of time. The results of this action, if any result is to come, will hardly materialize inside of sixty days, and some of the iron manufacturers put it at ninety days. The only certain achievement in connection with the whole operation is the financial benefit to accrue to the ore producers. The recent season has been so wretchedly poor, that a good many consumers of ore have had to meet their paper with paper, thus compelling the dealers to carry them much longer than usual. Now, that the furnacemen are no longer under the daily expense of coke, labor, and freights, they will be able to devote the receipts for their stocks of pig iron to the liquidation of their ore debts. It must be confessed, however, that the outlook for these sales are still exceedingly slim, and the demand is so very slight, that sometime must necessarily elapse before much money can be realized on the stocks of iron now in the various furnace yards. While there appears to be no particular reason for the falling off in the consumption of pig iron, it is a noteworthy fact that in nearly every case of serious shrinkage in manufacture there is a corresponding shrinkage in consumption. Little sales continue to be made from day to day, so small in volume as hardly to warrant the mention, and at prices below the cost of production. Regarding the new Cuban ores recently developed by Cleveland interests, it is learned that the ore in sight is almost unlimited in quantity. The ore is a high grade article, said to show 68 per cent. in iron, and running about .020 in phos. A line of railway, some four miles in length, has been constructed, connecting the mines with the seaboard, and the docks have been so nearly completed that shipments are expected to be made this coming season. The output, it is reported, will be about one thousand tons a day from the start, and will be increased as the market will warrant. While the chances are against the use of this ore west of the Allegheny mountains, the probability is not excluded of its coming into competition with Lake Superior ores as far west as Pittsburgh, and its presence will certainly operate against the shipment of Lake Superior ores east of the mountains, which has been the aim of some producers for the past few years.

SOME INTERESTING BOILER EXPERIMENTS.

About seven years ago, an old and experienced engineer and boiler inspector contributed to *The Iron Trade Review* an article in which he contended, contrary to all apparent precedents and the almost universal belief of steam-users, that there was no danger of explosion from supplying a red-hot boiler with cold water. The article awakened wide-spread discussion and much criticism from those who still held to the old theory, but the writer of the article valiantly held his ground, and ended by offering to take his seat on the safety valve of any boiler while the experiment was being tried. The offer was never accepted.

Now comes that able, experienced and universally respected body, the Manchester (England) Steam Users' Association, and, as the result of a series of carefully conducted experiments, fully sustain the position assumed by our correspondent in every particular. We have not space to go into detail regarding all of the experiments in question, but condense, from a contemporary, an account of the most important of them. Each crown was fitted with three fusible gauges, one being a disk of zinc six inches in diameter, secured with three set screws, and the other two being plain plugs ¾ inch in diameter, one of tin, the other of lead. In addition, a lead strip about 1½ inches wide and 1-16 inch thick was bound across the middle of each belt of plating, so as to afford an indication of the extent to which the overheating extended longitudinally along the crown of each tube. The fires were worked up to a brisk condition, the safety valves were loaded to twenty-five pounds, but with the water level with the crowns, the pressure rose to thirty pounds, both valves blowing freely. The first sign of overheating was at the end of eighteen minutes, when the lead plug on the left-hand furnace fused. In three more minutes, the tin plug gave way, and in two and a half minutes more the zinc disk on the other furnace melted, the water level at this time being 3⅝ inches below the crown of the tubes. At this moment the feed water was showered on the crown through a pipe laid directly over it. No increase of steam pressure was noted; on the contrary, it steadily declined, proving that, under the usual conditions of working, there is no sudden rise of pressure due to the entrance of water in an overheated boiler that is short of water.

AFTER NATURAL GAS, WHAT?

Vehement denials of local papers to the contrary notwithstanding, the reign of natural gas is hastening to a close. Western Pennsylvania, Southeastern and Northwestern Ohio and Indiana are slowly but surely approaching the beginning of the end, and the question is no longer, Will the supply fail? but, When will it fail? The statistical history of the rise of the natural gas industry is exceedingly instructive, especially so, since it is now believed to have reached "high-water mark." No data have ever been collected regarding the amount of natural gas consumed, but an approximate idea of the marvelous changes wrought by the introduction of nature's fuel may be obtained from a close estimate of the amount and value of coal displaced by natural gas. These figures are at hand for 1885, 1886, 1887 and 1888, and are well worthy preservation.

Of course, Pennsylvania leads, as she does in everything else industrial. In 1885 it was estimated that, in that State, 3,000,000 net tons of coal valued at $4,500,000 were so displaced. In 1886, 6,000,000 tons valued at $9,000,000 were displaced. In 1887, the aggregate rose to $8,883,000 tons, valued at $13,749,500, while in 1888, the amount reached 12,433,830 tons, valued at $19,281,375. Ohio is the next in importance, reporting 50,000 tons worth $100,000, displaced in 1885; 200,000 tons worth $400,000, in 1886; 500,000 tons valued at $1,000,000, in 1887, and 750,000 tons worth $1,500,000 in 1888. The detailed figures for 1888 are as follows:

	Coal displaced. Short tons.	Value.
Pennsylvania:		
Allegheny City	7,302,700	$ 0 223,780
Remainder of Pittsburgh district	2,447,330	3,670,995
Western Pennsylvania, outside Pittsburgh district	2,693,800	5 387 600
Ohio	750,000	1,500,000
New York	12 ,000	33 500
West Virginia	60 000	120,000
Indiana	660 000	1,320 0 0
Elsewhere	25 000	75 000
Total	14,362,830	$22,629,875

The totals for 1885 are: Coal displaced, 3,131,600 tons valued at $4,857,200; for 1886, 6,453,000 tons valued at $10,012,000; for 1887, 9,859,000 tons valued at $15,817,500.

The figures for 1889 and 1890 have not come under our observation, but it is safe to say that they will show a falling off.

WHAT WILL BE THE IRON ORE OUTPUT OF 1891?

Will the product of 1890 mark "high tide" in the history of the Lake Superior iron mines? One thing seems certain: that the output of 1891 will fall considerably below that of the year just closed. For the shipping season of 1890 the shipments from Lake Superior ports aggregated 8,143,146 tons. The rail shipments are estimated at 750,000 tons, making the total output of the mines 8,893,146 tons. That this enormous aggregate will be even approached in 1891 seems extremely improbable. Nothing in the present aspect of the market points to such a thing. With the blowing out of 16 furnaces in the Mahoning and Shenango valleys, having an annual capacity of 990,000 tons of pig iron, and with the wholesale laying off of iron miners, in some instances reaching 75 per cent. of the regular force employed, there is every reason to believe that this year will witness a marked falling off in production. And this is both wise and business-like. That there was a heavy overproduction in 1890 everybody knows, and that restriction is now the true policy is only too evident. The business of mining and marketing iron ore should never have degenerated into a mere race for the largest production, as it seems to have done in some quarters, but should be regulated by the all-prevailing laws of demand and supply. Prices, too, will have to seek a more normal level, and the whole business put on a more steady and enduring basis. We are aware that it is very easy to preach homilies to the trade, but there is nothing like stern facts to enforce much-needed lessons.

THE LEGALITY OF "COMBINES."

Colonel A. L. Conger, to whose active management the late American Harvester Company owed its existence, is reported as saying, concerning the reason for the dissolution of the company:

All that we did and our reasons for it are stated in that resolution which we adopted. It is simply this: We went into this project in good faith, expecting to perfect an organization that would be for the mutual interest of the manufacturer and the farmer and everybody whose interests had anything to do with it. But when we got ready to proceed to business and place our bonds, we met those legal embarrassments which naturally surround any organization of this kind under existing laws. There is no use denying the fact we had made some mistakes in our organization, that is to say, we found that the laws in some States, and the laws passed in opposition to such organizations by Congress, made a serious embarrassment to our proceeding. Undoubtedly, it would have endangered the investments that were carried into the company. We felt that all interests would be best protected by withdrawing and continuing the separate interests as they now are. We intended to make an organization that would be beyond criticism. We sought to avoid the features of the trust. We could not do justice to the various interests without a large amount of money, which we found we could not get on account of the legal objections.

It is not strange to learn, therefore, that there is no present intention of reorganizing the trust, and that several other contemplated "combines" have gone glimmering. The organizers of the harvester company are to be credited with honesty of purpose in the first instance, and are to be commended for promptly dropping the scheme upon discovering that it was open to legal objections. What effect this action will have upon similar organizations already in existence remains to be seen.

DESPITE the assertion of the Chattanooga *Tradesman* that the bill to abolish pig iron warrant speculation in Great Britain had been dropped, we find that it is not only again pending, but that it is attracting a great deal of attention among all the large commercial bodies of the United Kingdom The bill in question was only withdrawn from Parliament on account of the lateness of the session, and has now been re-introduced, and is being earnestly backed by such men as Mr. W. G. Ainslie, M. P., representing the iron trade of the Northwest of England; Mr. B. Hingley, M. P., Chairman of the South Staffordshire Iron Trade, and Mr. Isaac Wilson, M. P., representing the Cleveland district. The second reading is fixed for March 6th, and in the meantime the subject is to be brought up for discussion at the annual meeting of the Associated Chambers of Commerce. The present bill may not be sufficient to reach the end in view, but the need of some such legislation is universally conceded.

CLEVELAND was the first city in the United States to complete its manufacturing census of 1890.

THE New Year's edition of *The Iron Trade Review*, the well-known Cleveland publication, is a fine specimen of art, and a monument to the enterprise and ingenuity of those who planned and issued the beautiful number. Its typography is clear, and the matter contained in its columns is interesting alike to iron men and the public in general. Among the excellent productions adorning its pages is one illustrating the plan for the proposed Exposition building at Lake View Park in Cleveland. In variety of illustrations and excellence of reading matter, it is certainly a most creditable production.—[Ravenna (O.) Democratic Press.

THE special edition of the Cleveland *Iron Trade Review* is well deserving of mention. It is 84 pages quarto, profusely illustrated, and has an illuminated cover.—[Coal Trade Journal, New York.

THE BRITISH STEEL TRADE IN 1890.

Though the two great branches of the steel trade have had very different shares in the undoubted revival which has been known in the metal trades in the whole of the year 1890, there has been a fair amount of activity in both. The year began with a very full demand for steel plates for shipbuilding purposes, and this has continued during the whole of the year, but not to the same extent. There have been two or three months of dullness in the demand, but the end of the year sees a demand that is nearly at its best, and, taking the year as a whole, it has been one of full demand for open-hearth steel. In the demand for Bessemer steel there has been much more variation, and there has been over the year, as a whole, a dullness in the demand. Some mills have had full work, but at others there have been scarcely orders enough to keep the mills going, and other work than rails has been needed to give full employment. And in the face of the great activity on all our great lines of railways, this would at the first be surprising if it were not that it is well known that a large portion of the rails made are for extensions of railways rather than for repairs. It is true that the proportion needed for repairs of the lines increases yearly, both with the enlargement of the length of line and with the increase in the weight and speed of the trains that pass over it. The exports of steel rails have been fairly good, though less than in some years, and the home demand has been tolerably large for purposes of replacement, but not for new lines. Under these circumstances, the steel trade has had a moderately brisk year when both the chief branches of the trade are looked at together from this standpoint.

One fact is strikingly evident, and that is the continuation of the increase in the tonnage of steel plates used in shipbuilding. In the long lists of launches of vessels, which have just been published, this feature is marked, for there are many of the largest of the building firms whose tonnage has all been built of steel, and over the whole of the tonnage, the proportion of iron ships is not only small, but it is decreasing. This means that the shipowners prefer the steel-built ships to those of iron, and it points to the fact that the quantity of steel plates made probably shows a further increase, though the tonnage of the vessels built in the year is slightly less than that in the past year. And though the demand for new vessels is not quite what it was, there is still work in hand which will give work to the mills for months to come, in which period it may be fairly expected that further orders will be booked. But the dullness in shipping, and the fact that many steamships are laid idle now, lead to the belief that the rush of activity in the steel plate trade cannot be expected to continue at its full extent very much longer. A decline in demand would soon affect the price of plates, for the facilities of production are very great, and the competition would be more severe for such orders as were in the market. Some of the greatest of the works seem to be preparing for this by the laying down of mills for the use of the raw steel—angle mills, etc.—in the place of plates. Generally speaking, the output of plates is not so excessive in steel as it was in iron when the last period of dullness set in in shipbuilding, and therefore it can scarcely be expected that the fall will be so marked. But it is not improbable that the demand may be less and that the range of prices of steel plates may be lower than it has been on the average in the past year. In that time, hæmatite iron has been at a moderate price, and the price of steel plates has been, on the average, sufficient to allow of a fair profit to the producing firms generally, whilst there are makers who are favorably situated, and whose profits are known by the balance-sheets to have been extremely large for the year under consideration.

The Bessemer steel trade has not been so active in the year, but a number of the mills have had orders to keep them in full work, and the prices, remembering the low average of pig iron, have not been very low, though the tendency has been downwards. The railway companies seem, in the latter part of the year, to have been larger buyers, and their orders for next year are expected to be more considerable still. The demand for Bessemer steel rails has now more than taken the position of the old iron rails, for the demand is larger than it was, because of the extension of the line, and because of the larger export of rails of late years. The export branch of the rail trade is one which is most important, but the future of which is extremely difficult to forecast. In the manufacture in this country there has been a very general adoption of machinery to such an extent that the employment of hand labor is limited, whilst in many parts of the Continent labor has been at very low rates, and there has not been so large a use of machinery, but the labor movement abroad is forcing up its cost, and it is possible that British rails may be sent in larger quantities to some part of the Continent.

In both branches of the steel trade there have been alterations in the year in the relative production of the great districts. In steel plates, the closing of works in Wales must have reduced the output of the principality, but the production in the northeast of England has been increased, not only by the fuller working, but also because more works have been in operation this year. It is quite probable that the production of that district may be amongst the highest for the year, if not the highest. On the other hand, in Bessemer steel, the output seems to have increased in the Furness and West Cumberland district; and the facility that there is there for cheap production and shipment to the far West is great. And it is possible that we shall have to look to other than European buyers for orders for steel rails for great extensions of line, though there may be orders for replacement obtainable on the Continent. Before the trade, however, there are the possibilities of alterations of tariff, and hence the future is comparatively clouded, and all that can be said is that the needs of cheap production are even greater than ever. We have enlarged our production both of Siemens and Bessemer steel of late years; in 1879, we produced only 1,200,000 tons of ingots of the two kinds, but in 1889 we produced no less than 3 500,000 tons. The open hearth steel trade is chiefly one for home use; that for Bessemer steel is largely for export. For both, cheap production is essential, and the probability is that during the new year there will be cheaper coal, and that in other ways we shall have cheaper output, though sometimes it is seen that orders are kept back in a falling market.—[Colliery Guardian, London.

CRITICISM IN ARMOR PLATE MANUFACTURE AND TESTS.

In response to an inquiry concerning same, a prominent French engineer and metallurgist has written the *American Manufacturer* the following criticism on the comparative trial of armor plate at Annapolis:

Before the recent trials made in the United States—trials to which interested parties have perhaps given too much prominence—we all knew in France, and a long time ago, that by adding a small quantity of copper, or about 3 per cent. of nickel in the steel for ship plating, was a good thing, and if every one did not do it it is because there was no need of it to reach the conditions of trial imposed by the specifications, such conditions being, however, harder in France than in England.

The victory of le Creusot did not surprise any one at the trials of Annapolis—

1st Because nickel really improves metal.

2d. Because the French plates are generally better than the English plates.

3d. Because the French works possess more than the English works the art of taking special and unusual care when the question is to make a trial plate, outside of the common manufacture.

The delicate products, based upon the study of the molecular changes, are difficult to be understood in England, and I have had much trouble to teach their engineers the manufacture of chrome steel shells.

In a general way, the plates of English make are not as good and less regular than the French plates. This is owing to the fact that the English do not temper their plates; they seek to reach the desired hardness to prevent penetration by the composition of the steel itself, which is high in carbon with them, 1 per cent. and more.

In France, on the contrary, plates are made softer, viz.: lower in carbon, and the desired hardness is reached by a tempering, oftentimes followed by annealing. This operation, while it hardens the metal, makes it homogeneous in grain and obliterates the unequal tension arising from forge work and numerous reheatings.

The English, therefore, are on the wrong road; they will get out of it, and would have done so long ago if their specifications did not contain the particularly favorable condition that their plates are to be fired against surrounded by a strong iron frame, which conceals their brittleness. The French formula, with reason, prescribes a tempering, but there is but one national temper, the only one sure and regular, viz.: tempering in a molten metal. Such a bath possesses a great conductivity, and does not produce vapors interfering with calorific transmission.

From all this may be seen that if nickel steel as well as copper steel give an improved metal, it is only one step forward, and the best make will belong to him who will temper this metal.

This process is now much appreciated by many engineers and officers here.

Greece has just required this treatment for her last three steel-plated ships ordered by her government.

In the United States it is not yet applied, but several works have recognized its importance.

Ohio Institute of Mining Engineers.

The eleventh annual meeting of the Ohio Institute of Mining Engineers will be held at Lyndon Hall, south-east corner of Fourth and Long Streets, Columbus, O, beginning January 22d, 1891. Following is the program: Thursday, January 22d, 7:00 P. M.—Annual address of the President, Hon. Anthony Howells, Massillon, O; report of Secretary and Treasurer, Hon. R. M. Hazeltine, Columbus, O; "Municipal Corporations and Natural Gas Supplies," Prof. Edward Orton, State Geologist, Columbus, O.; miscellaneous business. Friday, January 23d, 9:00 A. M.—"The Ores and Minerals of Virginia, Exhibiting Specimens," J. A. Ede, M. E, Jackson, O; "Blast Furnace Tar and Ammonia," Prof. N. W. Lord, O. S. U.; "Management of Men in Mines," Wm. Hibbs, M. E, Linton, Jeff. Co., O.; "Mine Explosions in England and Wales, and Number of Lives Lost," Capt. J. L. Morris, Coshocton, O. The afternoon will be devoted to the visiting of the different manufactories of mining machinery, including The Jeffrey Manufacturing Co., The Minot Electrical Co., The Lechner Electrical Mining & Machine Co. 7:00 P. M.—Election of officers for the ensuing year; "Difference Between Mining Coal and Iron Ore," P. F. Schmidt, Post Boy, O; "Mine Ventilation as taught in the School of Mines O. S. U.," Prof. F. W. Speer; 'The Lower Coal Measures on the West Virginia side of the Ohio, Big Sandy and Twelve Pole Rivers," Hon. Andrew Roy, Mining Geologist, Glen Roy, O.

Experiments on the Strength of Steel.

A number of experiments were recently made in Germany on the alteration of strength of three different qualities of steel with the temperature. The specimens were prepared (1) from a 26 ton steel; (2) from 27-ton steel; and (3) from a 31-ton steel. The hardening matter was as nearly as possible pure carbon in every case. The temperature employed ranged from —20° C. up to 600° C. The results proved that, starting from the lowest temperature, the strength and percentage elongation of the test-pieces diminished together till a temperature of between 200° and 300° C., after which it rose to a maximum at about 300° C., and then fell continuously up to 600°, the highest temperature at which the specimens were tested. At 300° the maximum load on the specimen was 34 per cent. greater than that when the bar was tested at ordinary temperature, in the case of the 26-ton steel; 27 per cent. greater in the case of the 27-ton steel, and 25 per cent. greater in the case of the 31-ton metal.

PITTSBURGH district miners are opposed to the introduction of mining machinery.

MILLIONS IN THE PITTSBURGH IRON AND STEEL MILLS.

A carefully collated and prepared statement of the output of iron and steel in Pittsburgh and vicinity, for this year, has been made by Nick Dale, for the Pittsburgh *Dispatch*. Mr. Dale is so confident that his premises and conclusions are correct that he declares they can not and will not be truthfully denied by any one conversant with the facts. His statement follows:

The finished output of iron and steel in the Pittsburgh district for the year 1890 was simply enormous, and has never been surpassed in the history of the trade. In the tonnage of the last two years there was little difference, so far as the finished amount was concerned. The main drawback was in the scarcity of gas, which was nearly altogether in the last six months of 1889 and this year.

There was no lost time with labor troubles, and very little delay for repairs. The scarcity of gas restricted the output of puddled iron at least 50,000 tons, and the finished product at least 100,000 tons, but nevertheless the amount of muck iron made is considerably more than in 1889. In nearly a dozen mills there is hardly any difference in the raw and finished output, but the profit that the manufacturers made in proportion was by no means as great as the volume and the outlook at the present time.

The demand in the year 1890 could not have been any better, but the gains that some few firms had to content themselves with have seldom, if ever, been any less. It is not often that some raw material commands a better price than some of the finished grades, but that been the case during the greatest part of the year.

The manufacture of iron and steel is like any other branch of business. During the most flourishiug periods of trade there are always some who get despondent. This was seen by the owners of the Saw Mill Run Mill, when they leased their works to the Oliver Iron & Steel Co. It is sometimes astonishing to the general public when they hear that a firm has a profit of $100,000 or $1,000,000 a year. Even the iron workers are the most surprised, and of the latter, 99 per cent. do not know the cost of making a ton of iron or steel, or the amount necessary to operate an iron or steel plant, not including even the risks and losses, of which some are unavoidable. The expense to run the smallest mill in Pittsburgh, in which not a ton of iron has been finished in three years, is now about $1,000 a day, and from this the profit is less than $200.

The Pennsylvania Forge turned out, in 1890, 8 000 tons of muck iron, which was all sold, and on which there was a profit of $24,000. Chess, Cook & Co. is next. They turned out 9,600 tons of muck iron, of which 5 000 tons were sold, and the rest was consumed in their factory. Their profit was $45,000. The Clinton mill turned out 8,500 tons of muck bars; about 2,000 tons were sold, the rest was finished on a small profit, which was $35,000. Then comes the Pittsburgh Forge & Iron Works. With but one exception, there is not another mill of its size in Pittsburgh where the profit has been any less. The entire output is all kinds of railway stock supplies, excepting car wheels. In this branch of business the opposition has been very great in the last eight years. Nearly all the leading railroads and some of the car building companies, such as the Pullman Palace Co., make their own stock from raw material, largely made here. They produced 18,000 tons of muck iron, and the finished output was 20,000 tons, on which there was a profit of not more than $50,000.

Next is a statement of firms that make nothing but pipe iron, and are not connected with pipe mills. The Elba Iron Works produced 14,000 tons of muck bar, and the same amount was finished, on which the profit was $65,000. The output from the Keystone was 16,000 tons of muck bar, and finished 20,000 tons, on which was a profit of $100,000. The product from the Millvale mill was 10,500 tons of muck iron and 20,000 tons of iron and steel skelp. The profit on this was $140,000. The Republic Iron Works turned out 29 500 tons of puddled iron and 35,000 tons were finished, and on this the profit was $175,000. Then comes the Vesuvius mill of Moorhead Brothers & Co., at Sharpsburg, with 15 500 tons of muck bars and 27,000 tons finished. The inconvenience, owing to the scarcity of gas, was rather greater here than in any other mill in the district. The raw output was about 2,000 tons less than it otherwise would have been, and the finished amount was over 6,000 tons below that of last year, and the profit, which was very small, did not reach above $100,000.

Commencing with a number of firms making different grades, is the Soho mill, of Moorhead, McCleane & Co. It turned out 15 000 tons of muck bars, and finished 30,000 tons of iron and steel, which consisted of pipe iron and heavy boiler plates, but the leading make of this firm is black and galvanized sheet iron. The annual expense for acid in the galvanizing department is alone more than $20,000, and their profit was $450,000. The Sligo mill produced 14,500 tons of raw, and 17,000 tons of finished iron, of which the bulk was heavy plates, and on which the profit was $100,000.

Over in Allegheny, Lindsay & McCutcheon turned out 20,000 tons of muck bars. Of this, 12,000 tons were finished into all kinds of the lighter grades, and the rest was sold; the profit was $100,000. The next is the Pittburgh Iron Works, of J. Painter, Sons & Co. Perhaps never in the history of this firm did its mill turn out any more than in this year. The amount of muck iron made was 37,000 tons, which was nearly 9,000 tons more than last year. And the amount finished, which was all light iron, was 40,000; their profit was $200,000. Then comes the Sable mill, of Zug & Co., which is the leading one in the city, making largely common iron. The output was 21,000 tons of raw and 24,000 tons of finished iron, and the profit of this was $144,000. Now comes the smallest mill in Pittsburgh, making a raw and finished product, the Kensington, of Lloyd, Sons & Co., that turned out 10,000 tons of muck bar, and finished 10,000, which is among the leading grades in the market. Their profit was $150,000. At the Solar Iron & Steel Works, of William Clark & Co., the output was 14 000 tons of muck bar, and 17,000 tons of iron and steel were finished at a profit of $100,000.

Next is a list of firms whose profit is from $250,000 upward. The Wayne iron and steel firm of Brown & Co. turned ot 13,000 tons of muck bars, and finished 16,000 tons of all kinds of fine steel and iron. Their profit was $300,000. There is the steel firm of Howe, Brown & Co. It made 5,000 tons of dephosphorized puddled iron, and finished 10,000 tons of different grades of light and heavy fine steel, of which the most is not surpassed by very many in this country. Their profit was $400,000. Shoenberger & Co. turned out 13 600 tons of muck bar and finished 35,000 tons of iron and steel, on which their profit was $750,000. Singer, Nimick & Co. made 3,000 tons of dephorized muck iron, and finished 25,000 tons of fine steel, on which they had a profit of $500,000.

The next is a statement of two wrought iron pipe firms who make about two-thirds of their own skelp iron. There is no branch in any part of the iron business in which there is a greater profit than in iron pipe. Spang, Chalfant & Co. made 13,700 tons of muck bar and turned out 20 000 tons of iron and steel pipe, on which their profit was $800,000. This does not include the company store, in which the annual sales amount to $175,000.

Then come A. M. Byers & Co. They turned out 15 000 tons of muck bar and besides bought muck and skelp iron, and turned out 25 000 tons of pipe, which ranges from one-eighth of an inch to six inches in diameter. In connection with the pipe mill is also a galvanizing department. The profit to this firm was $900,000. A very important feature in connection herewith is that in the last eight years there has been very little difference in the amount turned out in this mill. It is known as the most active in the city, and yet the firm is in the market all the time buying muck bar and pipe iron.

Now comes four of Pittsburgh's largest firms, which are not equalled in the United States, and of which one is now not surpassed in the known world. The first of these is Park Brothers & Co., of the Black Diamond Steel Works. They made 13 500 tons of muck bar and finished 70 000 tons of steel of all kinds, on which their profit wrs $2 000,000. The second of these is the Oliver Iron & Steel Co. This firm, in its three rolling mills, turned out 51,000 tons of muck iron. But that is not all. It leased the Eagle Iron Works, which turned out 6,420 tons in this year, but only 4 200 tons since this firm had possession of it, and the finished output reached 100,000 tons of iron and steel. About 15 000 tons of old nails were reworked, and raw steel was made in the firm's Clapp-Griffith converter. The firm also bought a great deal of muck iron. It's profit, which is rather low, is $1,500,000.

The great success of this firm is paying its large indebtedness during a most critical period of the iron and steel business shows plainly what profit there is, or was, in the iron and steel trade. In the years that the firm cleared and paid over a million and a half, with interest, it made 50,000 tons; in the year 1887 it reached 70,000 tons; in 1888, 90,000 tons were finished, making in all 210,000 tons, from which the debts were paid. The amount finished last last year is about the same as in this. Jones & Laughlins, of the American Iron Works, come next. Fifty thousand tons of muck bar were turned out here, and the amount of iron and steel furnished reached 120,000 tons. The profit was $2,400,000. But this does not include the gain in the firm's mammoth store, in which the sales annually amount to fully $500,000. The fourth concern, which now leads the world, is that of Carnegie Brothers and Carnegie, Phipps & Co. In their two Pittsburgh mills, where there are 82 puddling furnaces, the output of muck iron was 41,000 tons, which was probably about 1,000 tons less than last year. But the finished output this year was greater than ever. It reached 550,000 tons, which is more than one-third of the entire amount made in Allegheny county, exclusive of Chartiers and McKeesport. Their profit was fully $5,000,000.

This firm has almost no profit in its mill at Twenty-ninth street. With the improvements that were made in the last four years, and of which some are now in progress, the plant is worth at least $1 000 000, the lawful interest on which would be $60,000 a year. The finished output for this year will only go a little over 30,000 tons, on which the profit of nearly one-half, such as railway car supplies, cannot be placed above $2 a ton. The cost to make a ton is not less than $20, with the average cost of Bessemer and mill metal at $16 50, and the selling price of the various finished grades is oftener below than above two cents a pound.

These firms all make puddled iron, excepting those in the two places stated above. The total therein shows 500,100 tons of muck iron. Last year this amount reached 472,800 tons, a difference of 27 300 more tons for this year, in which these firms finished 1 263,000 tons of iron and steel.

The last statement is the amount made by firms who make no puddled iron, and all excepting one manufacture steel only. The Linden Steel Works turned out 20,000 tons, on which the profit was $400,000. The Crescent Steel Works, of Miller, Metcalf, Parkin & Co, which has always been known to turn out the best and finest steel in the world, finished 15 000 tons, on which the profit was $500,000. The amount finished in La Belle Steel Mill was 7,500 tons, on which there was a profit of $150,000. The Spang Steel & Iron Works never surpassed its record of this year. The output was 30,000 tons, on which there was a profit of $600,000. The Glendon Spike Works, of Dilworth, Porter & Co., turned out 25,000 tons of railroad spikes, with a profit of $125,000.

Now comes a statement of two pipe mills, for which every ton of pipe iron has to be bought. The Pittsburgh Tube Works turned out 15,000 tons, on which there was a profit of $450,000. The Pennsylvania Tube Works made 70,000 tons, and its profit was very near $2,000,000; making a grand total of 1,438,500 tons.

THE substitution of crude petroleum for coal as a fuel under boilers has long been an actual fact in the West, in many large works where a great deal of power is required—notably in the instance of the South Chicago works of the Illinois Steel Co. The idea is a new one in the East, and an attempt to discard coal in favor of petroleum, which is now being made in the Massachusetts mills, is described by our exchanges with all the detail usual in the case of revolutionary innovations. If the experiments prove successful, it is said that the Standard Oil Co will pipe oil to the Lowell, Manchester and other city cotton mills, thus bringing the reign of smutty King Coal to an inglorious end in those districts.—[American Artisan.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MARQUETTE RANGE.

For the season just closed, the Lake Superior shipped 318,321 gross tons of ore, 31,088 tons of which were all-rail. This brings the total shipments of the mine to date up to 5,042,461 tons, at the top of the heap of all mines in the country. Of course, the mine has been in operation 37 years, but for many years in its earlier life it was wrought in a primitive manner, as it was without the improved appliances that have resulted within a very few years past. That it has sent out so many millions and that the shipments of the past season outstrip, by 15 412 gross tons, the product of any single season in the past, is pretty good proof that the "old reliable" is in very good health. The management is one that does not believe in crowding, but is content to keep on in a conservative manner. There is no doubt but that they could have largely increased the above figures had they been so disposed.—[Iron Ore.

GOGEBIC RANGE.

It is said that a dividend of $10 a share will soon be declared on the stock of the Ashland mine. The mine has been one of the largest shippers of the Gogebic range during the season, and its output amounted to nearly 400,000 tons. The stock was recently as high as $52, and is now quoted at about $58. —[Florence Mining News.

The Brotherton has a large stockpile of probably 12,000 tons, and is shipping a number of cars south every day by all-rail. The Brotherton is in first-class condition, and, if the market is favorable, will make a brilliant record next year. Considerable new machinery has been put in and the finishing touches on a large boiler are being made. The shafts extend from the east to the west of the property and all are hoisting ore.—[Florence Mining News.

At the Sunday Lake, work is progressing rapidly. Over 11,000 tons of ore in stock, and hoisting 400 tons every day, and the ore is as pretty a Bessemer as was ever raised from a mine. The vein here is widening out as depth is attained, and the Sunday Lake is bound to make a fine property.—[Florence Mining News.

VERMILION AND MESABA RANGES.

The Union Iron Co., in which the large vessel builder, Quayle, the Cleveland Wilsons, and Mr. Magius, of Duluth, are interested, at their late meeting, in Cleveland, decided to put crews to work at once in developing their property in section 30, 63 11, known as the McDonald claim. It is very rich in iron, and one of the leading mines on the range will, it is expected, be developed. —[Duluth Herald.

M. A. Bradley, of Cleveland, and Capt. Ward, of Iron Mountain, Mich., made a trip to the Mesaba a few days ago, and are now negotiating with John McKinley and Horace Williston for lands adjoining the Stone mine on the west, in section 18, 59-14. They will either purchase or lease this property and, in either event, will develop it at once.—[Duluth Herald.

Iron men are very sanguine of a movement in iron properties, this Spring, says the Duluth *Herald*, which has been unequaled heretofore in the history of either the Mesaba or Vermilion ranges. A large number of rich Cleveland men and Pennsylvania men are becoming interested in the Mesaba range, and there is more inquiry for iron properties than there has been for several years. There have also been more developments made in Mesaba property, owing to the public attention which has been lately called to its richness, than there has ever been before.

MENOMINEE RANGE.

Work at the Florence is being energetically pushed, notwithstanding the chaotic state of the iron market, and the non-payment of arrearages in wages. Two new lenses of ore have recently been struck, thus giving additional proof that this valuable mine possesses hundreds of thousands, if not millions, tons of ore within its confines. A diamond drill working from No. 7 shaft, in a northerly direction, struck ore at a distance of 140 feet and penetrated the metal 86 feet. Capt. Ball is now drilling toward the new find, the drift now being in some 78 feet. The diamond drill, recently operating at No. 4 shaft, struck a 58 foot lense of excellent ore 75 feet from the shaft, which will be opened up in the near future. The company is getting ready to put in a diamond drill in the swamp, nearly west of and only a few rods from the North-Western depot, in order to demonstrate the truth of the theory advanced long ago, that a body of ore exists in that vicinity. The boiler and drill will be ready for operation soon. If ore is found there, it would not be at all surprising if, at some future day, ore was found to be underneath the entire village of Florence. Stranger things than this have happened, notably the Lake Angeline find on the Marquette range. The management of the Florence are sinking No. 5 shaft from a seventh to an eighth level, and No. 7 from a fourth to a fifth level. For the past week or two only about an average of 300 tons of ore per day has been hoisted. Work at No. 4, which was suspended some time ago, in order to fill up the openings on the two upper levels, in proximity to No. 6, with sand from the surface above, has been resumed, and 600 to 700 tons will be hoisted daily, from now on. Considerable ore is already in stock. The setting up of the mammoth new compressor, at the old engine house, is nearly completed, and the huge piece of machinery will be ready for business in a very few days. This will greatly aid underground work, giving the mine much needed additional power for working its drills.—[Florence Mining News.

The Curry mine is making large stockpiles of ore. There is every reason to believe that this mine will equal in product any mine of the Penn Co.'s group.—[Norway Current.

The Winter's work at the Paint River has fairly begun. "B" shaft is being sunk, and is now 60 feet below the bottom level, and in ore, and the sinking is being pushed as fast as time and skill can do it. Ore is being hoisted from both "A" and "B" shafts from the upper levels, the ore being taken from the pillars. These pillars will be so far taken out by Spring as to allow the surface drift and sand to reach the present bottom level.—[Norway Current.

Messrs. Smith & Ray, of Milwaukee, have discontinued indefinitely all their exploratory work in this district. For a year or more exploring has been carried on in the Michigamme region, near the Mansfield property, the territory under operation being northwest quarter of the southwest quarter of section 17, and the southwest quarter of the northwest quarter of section 20, 43-31, north and south of the Mansfield mine, respectively. No work has been done on the north description for several months past. Messrs. Smith & Ray will probably take up work again in the Spring.—[Diamond Drill, Crystal Falls.

The Hemlock mine, at Pickands, did not reduce its force with the advent of Winter, but will continue to develop the splendid property, to be in readiness to get in line with the other shippers when the new season opens. During developmental work a large stockpile has accumulated. The Hemlock mine is located near the center of the southwest quarter of section 4, 44 33 and the average width of the deposit so far shown is 30 feet. The ore has been found in its longitude about 600 feet, without encountering any terminus. The product is of a prime quality, the following being an average analysis, made by the company's chemist: Metalic iron, 65 per cent.: phosphorus, 126-1,000ths.—[Diamond Drill, Crystal Falls.

The shaft at the Tobin find is down 100 feet, the greater distance in what now shows to be the foot wall, but which will eventually prove the hanging. The ground is ore, mixed with jasper. From the bottom of the shaft a crosscut is going south to get the width. At a depth of 63 feet the vein was crosscut and was 27 feet wide. The present work will be continued until the width is determined, when a drift will be commenced and the length established Progress of work at this property is watched with considerable interest, from the fact that every analysis yet taken gives Bessemer returns, the average analytical returns being 68 80 in metallic iron and .037 in phosphorus, rendering it an ore that will find a ready market anywhere and at any time. The location is the east half of the southeast quarter of section 30, 43-32, a little better than one mile southwest of this city.—[Diamond Drill, Crystal Falls.

On the North Shore:—

Mr. F. S. Wiley, of Port Arthur, in conversation with a Duluth *Herald* reporter, last week, gave some interesting information concerning projected new railroads in the vicinity of Port Arthur, which will open up new and rich iron ore fields. The Port Arthur, Duluth & Western Railroad has been built to Sand Lake, from which point the Ontario & Rainy Lake road will be pushed through one of the richest mining countries in the world. Among other things he said: "It will tap the celebrated gold township in the Huronian formation, and will lay open all the treasure of the Aticokan range. The Ontario government has set off a bonus of $3,000 a mile for the construction of this road, and the work will commence upon it in the Spring. The American syndicate, in which Messrs. Van Hyse, Pumpelly, Smythe and Merriam are interested, and who lately purchased a tract of 15,000 acres of iron lands 25 miles west of Port Arthur, held a meeting recently and decided to commence developing the property at once. The whole tract is adjacent to the Canadian Pacific road, and shipments can be made just as soon as the ore can be gotten out."

Mr. Wiley also said that nearly all of the richest mineral lands had been gobbled up by speculators in the Port Arthur district, and the Ontario legislature had come to the conclusion that something must be done. They are at present contemplating a bill something after the fashion of Minnesota's mineral land's lease bill by virtue of which a royalty is charged and the party renting is obliged to do so much developing each year. Port Arthur has been aroused to the fact that she must bestir herself to become a great iron center, and has voted a bonus of $15,000 for the building of ore docks, $20,000 for the building of a blast furnace, and a free site for the building of a silver smelter.

A Recent Find of Iron Ore in Wayne County, New York:—

A correspondent writes *The Iron Trade Review* as follows: "Two years ago, a well was drilled for gas at Wolcott, Wayne county, N. Y. Getting down about 140 feet, they struck a vein of iron ore. The man who drilled the well writes that he is willing to make an affidavit that the vein was at least seven feet in thickness. A year ago I went a mile north of this well, to the head of Port Bay, and found ore in the vein. I leased the flat land and the edges of the hills at the head of the bay. Last Fall I prospected and found ore in the vein from twelve to 16 inches in thickness. The surface is covered with slate or blue shale, from three to seven feet in depth, and not hard rock. I blasted out several places and found the quality of ore ran very even. It is a dark brown hematite, and will yield at least 55 per cent. iron, with a small per cent. of phosphorus. I then leased 200 acres."

The Smoke Problem.

In Europe, the problem of smoke prevention has, of late, attracted considerable attention. In Saxony, a government appropriation of about $1,750 has been made for practical tests of smoke preventing appliances, and at Vienna, a commission was recently appointed to investigate and report upon the subject. In England, also, various sums of money have been collected to defray expenses of investigation. The generally accepted opinion seems to be that domestic fireplaces are responsible for nearly as much of the smoke evil as factory chimneys. Fr. Siemens is quoted as saying that absolute smoke prevention can be secured only by the universal use of gaseous fuel and central stations for the manufacture of the gas.

HON. EDWARD ATKINSON'S paper on "The Future Situs of the Principal Iron Production of the World" has been published in pamphlet form by the *Manufacturers' Record*, of Baltimore; price, 25 cents per copy.

THE ALUMINUM AIR SHIP.

The Pennington air ship, a description of which has been going the rounds of the daily press for some months past, did not make its first trip from Mount Carmel, Ill., to St. Louis, Chicago and New York, on the 1st of January, as its projectors promised. At the last meeting of the board of directors, held in Chicago, it is stated, however, that the condition of affairs of the company was so satisfactory that it was decided to add $5 000,000 of the $20,000,000 paid up capital to the further extension of the plant. The stockholders are fully satisfied that the ship will make at least 200 miles per hour. The dimensions of the first of the ships to be constructed are given as follows: The buoyancy chamber will be 170 feet in length and 28 feet in diameter, with a lifting power of 5,500 pounds. The gas engine will weigh but 250 pounds, and will develop 100 horse-power. The total weight of the ship will be 1,350 pounds. It will accommodate 50 passengers, and the cost of the ship will be $3 500. This slight cost is made possible by the fact that the company has its own process of making aluminum, of which the ships will be almost entirely constructed.

The daily press has allowed these figures to pass without question, as it is not apt to trouble itself with arithmetical computations, but as engineers we are sufficiently interested in the projected ship to study the figures a little, and derive some further information from them.

The buoyancy chamber, 170 feet long and 28 feet in diameter, would have a superficial area of not less than 12,000 square feet. If we assume that the total weight of the ship, 1,350 pounds, is only that of the outside sheathing, allowing nothing for framework, machinery, or other inside structures or contents, then the weight of the sheathing is only about 0.11 pounds per square foot. As aluminum weighs about 13⅓ pounds per square foot one inch thick, this would make the thickness of the sheathing only about 0.008 inch, or say No. 33 Birmingham gauge.

The cubic contents of the buoyancy chamber would be about 90 000 cubic feet It is probably to be filled with hydrogen gas, and the amount of the buoyancy can be easily calculated by assuming that the chamber is buoyed up by a force equal to the difference between the weight of 90,000 cubic feet of air, and that of the same bulk of hydrogen. But possibly it is intended to use a vacuum, in which case the buoyancy would be due to the weight of 90,000 cubic feet of air, or say, 7,000 pounds. Deducting the weight of the sheathing, we have 5 650 pounds as to the net buoyancy of the chamber, or very nearly the same as the lifting force, 5,500 pounds, mentioned in the description. But this makes no allowance for weight of the framework necessary to hold the sheathing in place, for the engines or other machinery, for the seats necessary to accommodate the 50 passengers, and for other such trifles.

The problem of building a framework 170 feet long and 20 feet diameter, stiff enough to prevent the collapse of the sheathing and to sustain the weight of itself and of the passengers, machinery, etc., and yet not weighing over 5,500 pounds, would be pronounced impossible of solution by engineers accustomed to work on steel; but, of course, there are no structural impossibilities in the creed of the Mount Carmel directors.

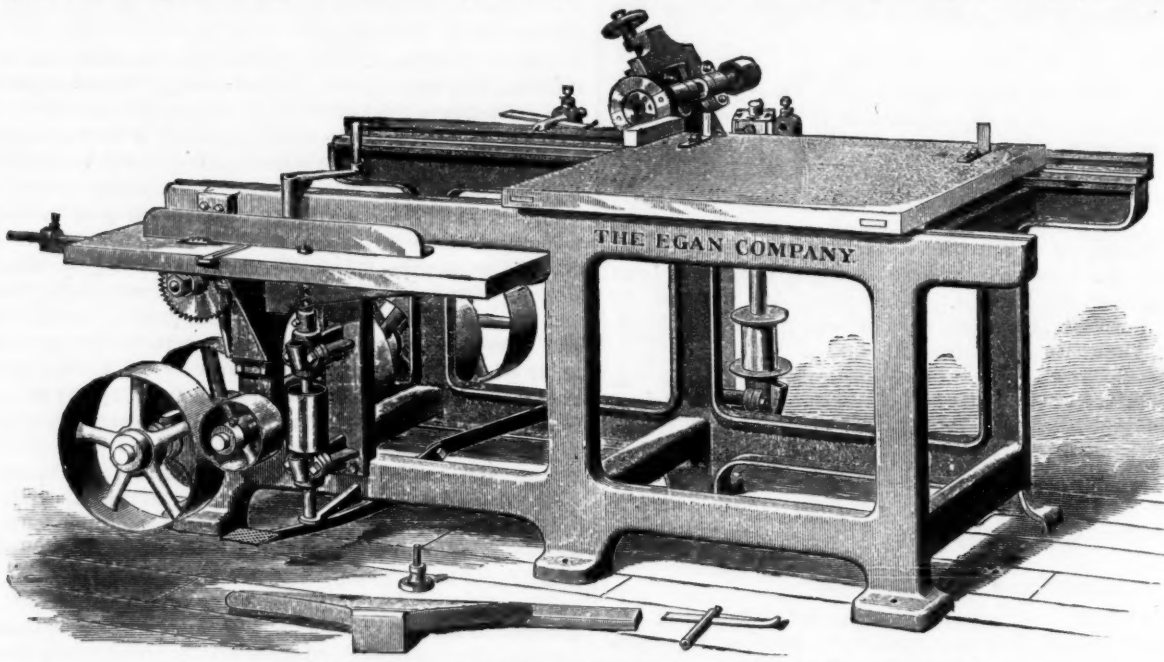
The cost of the ship, $3 500, is put, we think, rather low, for we doubt if any rolling mill in the world would contract to roll the sheathing in this ship, 12,000 feet of aluminum and only .008 inch thick, for much less than the whole figure named, even if it obtained the ingot aluminum for nothing. But it is likely that the Mount Carmel Co. has some new rolling process, as well as its own secret process, for making aluminum. They have surely also something new in gas engines, for the stated weight, only two-fifths of a pound per horse power, is far less than that of the lightest engines heretofore known —those for driving automobile torpedoes. They must also have some plan of hardening and strengthening the aluminum, for if only .008 inch thick and of ordinary aluminum, it would be apt to be perforated by woodpeckers or other birds lighting upon it, besides being torn if accidentally rubbed against a tree on one of its trips.

These difficulties or objections to the air ship are, however, only those which would be raised by engineers of the old school, who know nothing of aluminum constructions. They vanish into thin air when viewed, not from an engineer's standpoint, but from that of a Mount Carmel projector. The air ship, as above described, is shown by arithmetic and by engineering calculations to be an impossibility; but this only shows that the problem is beyond the criticism of engineers, and lies just as much outside of their field as do metaphysics, biology or the Keeley motor, which latter, as is now well understood, is not an engineering device at all, but a problem in psychology.

We engineers, however, cannot help being skeptical concerning such projects as the air ship, and in this case our skepticism extends so far as to lead us to doubt even if there is really such a project as the Mount Carmel Aerial Navigation Co., and whether or not it is not merely the offspring of some lively newspaper writer's imagination. Mount Carmel is a rather obscure town in the southern part of Illinois, but just such a town as is likely to bring forth some newspaper genius who would delight in hoaxing the associated press and the reading public of the country generally.—[Engineering and Mining Journal.

SASH AND BLIND, JOINTING, RABBETTING AND FINISHING MACHINE.

Any kind of a machine for the working of wood cannot be too much improved, for then the mechanism is so much more capable of producing the best of work in the largest quantity. The famous Egan Co., always on the alert to serve wood-workers with time and labor-saving tools, have just introduced a novelty, which we display a cut of, by their permission, on this page, and are furnished the following information concerning it, viz: This machine is designed for finishing the edges of sash, and rabbetting, beading and jointing the edges of blinds, grooving and boring sash for the cords, and the endless variety of finishing work of this kind in sash, door and blind factories. It does the same amount of work that heretofore required three machines, and, taking into consideration the amount of floor space saved, and the general utility of the machine, it should recommend it to all men making this class of work. The frame is very strong, thoroughly braced and planed perfectly true



SASH AND BLIND, JOINTING, RABBETTING AND FINISHING MACHINE.

with the countershaft connected at the base. The top of the frame receives a sliding table working in planed ways for working sash. A stationary table is also furnished for working blinds, when the three cutter heads are brought into operation at once. The bed is also adjustable on the frame, and is provided with a saw mandrel for cutting all kinds of grooves, and a boring mandrel, operated by a treadle, for boring the hole for the cord in the sash, which is then passed to the grooving saw, completing the job at one operation, without taking the sash from the table. The capacity of the machine is extraordinary, and it makes an invaluable tool for sash and blind work. Each machine is furnished complete with the necessary posts and springs, wrenches, cutter heads, etc. For further information, address the builders and originators, the Egan Co., Nos. 251 to 271 West Front street, Cincinnati, O.

Still After the Mahoning Valley Mills.

Messrs. Parker and Godfrey, the promoters of the scheme to sell the iron mills of the Mahoning Valley to an English syndicate, which received a setback, it is said, by reason of the elections in November, are again in the city in the interests of the scheme. Mr. Parker has a letter from his English correspondent saying that if the properties are as represented and otherwise desirable, the syndicate there stand ready to purchase them at the figures named. In pursuance to this, he is soliciting options on the properties until April 30. In most cases he is getting them, but the outcome is too problematical at this time to venture an opinion as to what it will be. Mr. Parker is a son of the gentleman for whom Parker's Landing in the Pennsylvania oil regions, was named, and he came originally from that vicinity. He has had considerable experience in promoting purchases by English syndicates, and has been successful in that field. Mr. Godfrey is a Chicago lawyer, and has been associated with him as legal adviser in several of these enterprises. The gentlemen expect to be in Youngstown for several days.—[Youngstown (O.) Telegram, January 11.

IMPROVING FINANCIAL PROSPECTS.

Two points of interest attract the chief anxiety of our banking and mercantile community in looking forward to the coming season, the condition of public and private credit, and the anticipation of the export movement of gold. Closely connected with these is the state of the money market and the bank clearings and reserves. The remarkable fact is noted in regard to the banks, that notwithstanding the numerous complaints that have been made, the bank reserves have not fallen below the legal level except for 10 of the weekly statements during the whole year, the average deficiency recorded having been less than $2 000,000. This will be regarded as a very gratifying result as is also the fact that the condition is rapidly improving and that since September 13, the deficiency has never occurred for more than two weeks in succession. The expectation is that in a very short time the weekly statements of the banks will be resumed as usual. This resumption of the reports is greatly to be desired in the interest of the stability of the monetary movements during the critical period preliminary to the opening of the Spring trade.

With regard to the export of gold, it may be stated that although the rates of foreign exchange are now higher, the prevailing low quotations recently led some persons to argue in favor of further gold imports from Europe. Practical observers, however, have not accepted this view, which is founded on temporary contingencies. The expectation of a further rise in sterling exchange is due in part to the purchase of bills by importers. But for the close money market the foreign exchanges would have been more perturbed by this and other movements of like tendency. Among them is the report from Washington that for 11 months of 1890, our imports of merchandise were $762 300,471, and the exports $759 180 494, showing an excess of imports amounting to $3,119 977. Last year the balance was the other way. The exports were $730,000,000 and the imports $710,000,000, giving an excess of exports amounting $19 581 456. Another indication is the rumor of the further shipment from London of gold to Berlin, which has caused some surprise and much discussion Still these anticipated losses of gold by the Bank of England are not very large and could easily be checked by a return to its recent 6 per cent. rates for money.

The London financial press direct attention to the strength given by the influx into its reserves last month, of more than 7 000,000 sterling of gold The bankers recall the fact, however, that £4 500 000 of these gold supplies replenishing the bank reserves were borrowed and must be returned. 3,000,000 sterling were lent by the Bank of France and may be repaid next February, and £1,500,000 were lent by Russia from the proceeds of its recent sale of Russian bonds, and will be reimbursed after the Exchequer bonds, which were given in payment, mature next June, at which time there will perhaps be developed the usual improvement in the financial situation incident to that plethoric period of the fiscal year. The London *Economist* reports that these rumored exports will be checked by various causes, that to Russia being postponed by the arrangement previously referred to.

Finally, it is observed that the demand in Europe, both on the Continent and in England, for our securities is reviving, and is likely during the coming year to assume dimensions much larger than in 1890. It is not believed that this wholesome movement will be checked by any action at Washington of the Joint Committee on Immigration, which began on Wednesday, December 31, its investigation into the sale of American industries to foreign capitalists. It is estimated that the investments of European capital in this country amount to about $2,000,000,000 Any perturbation of public and private credit which would give the sellers of our securities in London a call for our gold, might disturb our markets as in November last, when during a single fortnight the European exchanges went up to the gold exporting point, and down to the gold importing point, to the great inconvenience and derangement of our foreign trade. Our total gold imports for the year 1890 so far as reported have been $13 618,894, an increase of $7,166,301 as compared with last year. The gold exports so far recorded for this year were $19 398 997, showing a decrease of $58 284,196 as compared with last year. On the whole, we may conclude that for the present, unless some unexpected financial legislation should be adopted by Congress, there will be no monetary disturbance in the early future from any of the financial sources mentioned, and that not a few of the causes of the perturbations and mercantile failures of the last three months have spent their force. It is reassuring to find that these insolvencies have not been so numerous as was supposed. The aggregate during 1890 was 10,907, only 25 more than last year. As is elsewhere explained, however, the liabilities are greater. Their total is $189.000,000, which is $41,000 000 more than in 1889, and exceeds the total of any year since 1884, which was $226,000,000.—[American Banker.

The Great Valley Shut-down.

The great shut down of Mahoning and Shenango Valley blast furnaces went into effect last week. The stacks out, with their annual production, are the following:

	Tons.
Brier Hill Iron & Coal Co., three stacks	125 000
Andrews Bros., Haselton, two stacks	80,000
Himrod Furnaces, two stacks	65,000
Struthers Furnace, Struthers	40,000
Hannah Furnace, Youngstown	50,000
Girard Furnace Girard	75, 00
Hubbard Furnaces, Hubbard	75,000
Mary Furnace, Lowellville	45,000
Claire Furnace, Sharpsville	50,000
Douglass Furnaces Sharpsville	60 000
Mabel Furnaces Sharpsville	50 0 0
Sharpsville Furnace, Sharpsville	40 000
Sparrman Furnace, Sharpsville	60,000
Stewart Furnace, Sharon	30,000
Sharon Furnace, Sharon	25,000
Wheeler Furnaces, three stacks, Middlesex	100,000

The Youngstown (O) *Telegram*, of Jan. 11, says: Of the 23 blast furnaces in the twin valleys of the Mahoning and Shenango, whose operators, at the recent meeting held in this city, agreed to bank them by yesterday, the majority have been banked, and the remainder will be within the next few days, so that practically the agreement has been consummated. These stacks each give on an average employment to 100 men, so that 2,300 men are directly thrown out of work, minus, of course, the comparatively small per cent. who always find employment about idle stacks. Indirectly four or five times that number of men will be affected. These are employes in limestone quarries, coke works, coal mines, etc., whose products the capacious maws of the furnaces consume, and anent this phase of the question it is suggestive to note a telegraphic dispatch last night from Scottdale, which says: "Between 900 and 1,000 men were thrown out of employment to day by the shutting down of the Schoonmaker and Southwest coke companies. The miners not affected will divide up their work with their fellow-men. The closing down of the Mahoning and Shenango valley furnaces to-day makes the situation more serious in this region." In the aggregate there will be in the neighborhood of 10,000 or 11,000 employes affected by the shut down, and pursuing the subject to its logical conclusion, 30,000 or 40,000 persons will be affected, for the majority of these employes have families dependent on them. The results, it will be seen, will be more widespread than indicated by a casual, surface view of the situation.

THE CONNELLSVILLE COKE TRADE IN 1890.

The Connellsville *Courier* is entitled to great credit for its enterprise in compiling the statistics of the Connellsville coke trade for 1890. The facts set forth are of general interest to the country, and are herewith presented in abbreviated form:

The coke trade of the Connellsville region for 1890 has amply fulfilled the predictions made in these columns a year ago, namely, that it would not only equal, but surpass, the phenomenal output of 1889, which beat the record of that time from 15 to 20 per cent. During the year just ended the Connellsville producers marketed 6 221,518 tons of coke; and what is more gratifying, not to the coke operators alone, but to the entire region, which shared in their prosperity, the bulk of this coke was sold at a better price than coke has ever commanded since the sporadic boom of 1879. The output for the first two months in the year was sold for $1.75 per ton, and the price for the remainder of the year was $2.15. The trade of the year may, therefore, be said to represent in round figures an income of $12 900,000. The output of 1889 was 5 825,826 tons. The prices that year varied from $1 00 to $1 75 per ton, the average price being about $1.40. At this rate the value of the total output was, roughly estimated, $8 150,000. The coke trade of 1890 was, therefore, 50 per cent. better than that of the previous year. The growth of trade during the past five years may be summarized as follows:

Year.	Tons made.	Value.
1886	4,109,331	$5,870,343
1887	4,760,343	8,4 3 072
1888	4,971,487	5,965,544
1889	5 825,826	8 150. 56
1890	6,221,518	12,503 940

Oven-building has been active during the year, over 1,600 new ovens having been erected, besides a large number rebuilt. Our table shows an increase of from 14 458 to 16,020. The latter total is still further increased by the completion of 25 of their 150 new ovens by the Juniata Coke Co., at their Juniata works, in Dunbar township, and the Chester plant of 23 ovens, built by E. A. Humphries & Co., near Vance's Mills. There are also 45 unfinished ovens at the new Lemont No. 2 works of the McClure Coke Co., which will be completed as soon as possible. These will swell the total ovenage to 16,113.

The shipments for 1890 show a grand total of 355.070 cars, an average of 1,147 cars for every working day in the year, nearly 100 cars per day better than 1889.

The price of coke, which has been firmly maintained at $2 15 during the last ten months of the year, has never, of course, been entirely satisfactory to the furnacemen, who, during the past few months have made vigorous demands for a reduction, not only in the price of coke, but in railroad freights also. Their importunities, and the known depressed condition of the iron trade, led the operators to reduce the price of coke 25 cents per ton for the present, with the understanding that it will shortly be advanced again to at least $2.00.

British Shipbuilding of the Year.

Although the shipbuilders have not been so busy in some portions of the United Kingdom as last year, the gross tonnage launched has not fallen far short of the total of 1889, the highest on record. The Clyde and the Tay, with the Tees and the Hartlepools, have almost made good the decline in the other shipbuilding ports, so that the net reduction is only 30,000 tons on a total of 1,250,000 tons. The totals for the principal rivers are as follows:

	Total tons.	Increase.	Decrease.
Clyde	349 995	14,794	.....
Tyne	235,567	.....	46 143
Wear	197,482	.....	19,854
Tees	127,741	17,305	.....
Hartlepools	99,847	13,972	.....
Belfast	66,783	.....	16,220
Mersey	30 577	.....	5,195
Barrow	24,665	.....	2,182
Dundee	24,494	6,183	.....
Thames	17,000	9,000	.....

It is thus seen that the Clyde is ahead of any of the other rivers, and it is the Clyde which has put the largest amount of tonnage into the water during the year. Comparing the total production of the whole country with the previous nine years, some remarkable fluctuations are shown:

	Tonnage.		Tonnage.
1881	1,000,000	1886	473,000
1882	1,200 000	1887	578,000
1883	1,250,000	1888	503,687
1884	750,000	1889	1,300,938
1885	540,000	1890	1,271,110

The outlook for 1891 is not so bright as a year ago, for, although well on to 1,000,000 tons remain in course of construction, there is very little inquiry for new orders, and the fall in shipping freights, does not offer much inducement to fresh building.

CHICAGO ALREADY MANUFACTURING TINPLATE.

The Chicago *Grocer* has known for several months that the well known firm of can-makers, Messrs. Norton Brothers, of that city, would begin, as soon as possible, the manufacturing of tinplate. The *Grocer* was requested, however, not to mention the fact, and it has been held in confidence until the present time. As the fact that tinplate can and will be made in this country, if properly protected, has been proved, there is no longer any reason why secrecy should be observed, and accordingly that paper requested a statement from Norton Brothers, who have answered as follows:

EDITOR CHICAGO GROCER:

Dear Sir—Replying to your inquiry, would say that we have begun the manufacture of tinplate on a commercial scale, and intend to push the business unless the duty is repealed. We intend to make soft steel plates exclusively, making our own steel. We are building and have nearly completed a Siemens steel furnace and rolling mill, for producing the sheets for tinning. Our engines, boilers and machinery are now on the ground and being placed as rapidly as possible. We hope to have the rolling mill in operation within a month.

We imported from England, during the past Summer, a complete outfit for tinning the plates. This includes the latest improvements used by makers of the best plates there. We bought a block of ground at Maywood, adjoining our can factory, on the line of the C. & N.-W. Railroad, put up the necessary buildings and set up the tinning plant. Last week we made our first tinplates, and are pleased to say that they are fully equal to the best we ever imported, so far as the tinning is concerned. In order to get started without waiting for our rolling mill, which requires some time to build, we imported from England a quantity of the black sheets. These we are working on now. We found a good many workmen scattered about the country who had worked for years in Welsh tinplate works, and gathered force enough in this way to man our plant with experienced help. Since it became known that we are at work, we have applications from more men than we can employ at present, and we anticipate no difficulty in getting all the skilled help we shall require. We have a fully equipped machine shop, and can readily duplicate the imported machinery to increase our plant.

We embarked in this business from necessity and in the fullest confidence that the settled policy of the Government to encourage and protect home manufactures would continue. As large consumers of tinplates, we have numerous disadvantages in getting our stock from Europe that we cannot explain in a letter. We expect to overcome these by making our own plates, and, though they will cost us more at first than imported plates, we hope soon to reduce the cost by improvements in machinery and processes to less than the foreign plates have cost us, at the same time improving the quality. We see no reason why such improvements should not be made in tinplate manufacture as well as in other lines of work. When we started the manufacture of fruit cans by machinery, in 1880, we were told that this class of cans could only be made by hand. We have in ten years reduced the labor cost from $5 to 50 cents. That is, we are doing to-day by our improved machinery for 50 cents that which in 1880 could not be done for less than $5 by the most economical methods in use at that time. Meantime, our workmen are earning better wages than was ever possible under the old *regime* of making cans by hand, and the product of the machines is universally acknowledged to be superior to that formerly made by hand.

To embark in the business on a commercial scale requires a large investment of money, a willingness to take some chances of failure for the sake of the possibility of an ultimate brilliant success, and patience to work out the problem of inventing and adapting labor-saving machinery to compete with the poorly-paid hand labor of England. The English say we cannot compete with them, even with the new duty, and pay such wages as American workmen are accustomed to. We should not find it very profitable if we adopted their methods entirely, but we shall soon find means to make one of our workmen do as much as five of theirs, and if we pay him three or four times the wages, we shall still have an advantage.

The proposition to reduce the duty again to one cent per pound seems to us a step backward. For several years that duty prevailed. The field was open, and no manufacturer could see any possibility of making plates profitably under that protection. If it is desirable that we should make our own plates, the new duty should be maintained. If, on the other hand, the people would be better off to import their supplies, the duty should be removed entirely. One cent per pound is an onerous tax that benefits no one. Give us Protection that protects, or give us Free Trade. We believe the country is willing to pay a little more for its tinplate for a time for the sake of the reduction in price and improvement in quality sure to follow in American manufacture. Respectfully, NORTON BROS.

CHICAGO, December 16, 1890.

Forging Steel by Hydraulic Power.

Hydraulic forging presses are now in operation all over Europe, and are effecting a complete revolution in the working of large masses of steel. What used to be considered wonderful results in the forging of iron by means of the Nasmyth hammer are now quite put in the shade by the hydraulic forging presses of immense power produced at the Goodman-street Engineering Works in Leeds, whence was provided, not very long ago, the first large forging press that ever was made, and which is now in full work at the armor-plate manufactory in Sheffield, of Messrs. John Brown & Co. (Limited) It is of 4,000 tons, and is worked by 2,000 horse-power pumping engines, and commanded by power-traveling cranes capable of lifting 150 tons. At the works of Herr Krupp, and at those of Schneider & Co., in France, similar presses are now at work, and one has been erected at the Terni works in Italy, whence the forging of guns and armour plates is largely carried on. A 4,000-ton press, ordered by a Chatillon company, has been delivered, and is now in course of erection by the Leeds firm. As showing how widely the use of hydraulic power is being adopted, because of its vast capability, it may be mentioned that Tannett, Walker & Co., of Leeds, are putting down for the Midland Railway Co., at their goods stations in Birmingham and Leeds (both of which are undergoing large extensions), hydraulic plant whereby more facility than heretofore will be obtained to deal with the immensely increasing traffic.—[London Iron and Coal Trades Review.

ALLEGED FRAUD IN THE SCOTCH PIG IRON WARRANT SYSTEM.

By all who take any direct interest in the subject, it is well enough known that as against the pig iron which makers and others place in the public yards owned by Messrs. Connal, warrants, each one representative of 500 tons, are issued. But it is not generally understood that the quantities, or lots, of 500 tons, of which each warrant consists, are made up in the proportions of three-fifths No. 1, and two-fifths No 3 quality. Holders of warrants have at all times the power to split them; that is to say, they can, through arrangement with Messrs Connal, withdraw a portion of No. 1 or No. 3 iron, but from that date the warrant becomes an odd or broken one, and passes, for all practical purposes, out of circulation. Some of the operators on the Glasgow iron market, being asked for an explanation why the withdrawals from stores have of late been so moderate, comparatively, have come to the conclusion that the withdrawals have been largely, if not solely, of No. 3 or ordinary iron; that for this purpose warrants have been freely split; and they calculate that, accordingly, the available stock of iron represented by unbroken warrants, and which alone are publicly negotiable, does not exceed 500 000 tons, the balance of 93 000 tons being No. 1 sorts. There can be no doubt that, if such be the case, it is a matter of no small importance from a speculative point of view, and that is the consideration which mainly weighs just now with many dealers. In order that the position should be quite clearly defined, a requisition is being prepared for presentation to Messrs. Connal, asking them to declare to what extent splitting has been engaged in; in other works, to define the composition of what are regarded as public stocks.

It is not generally expected that the inquiry will be recognized, though there really seems no good or sufficient reason why, in the public interest, regular statements should not be published, giving the exact quantities of No. 1 and No. 3 iron accumulated in outside stores. If, however, the amount of No. 1 iron in sight is so much larger (as is estimated) than has been calculcted on, the fact is an unpleasant one for the Scotch iron master, as there is so much more iron available for competition with him in the foreign market, when he ventures to resume production. It may be that the movement now on foot has for its object the facilitating of the operations of the "bull" party, who are credited with aiming at a "corner" in Scotch iron. There has been very large buying recently by one of the principal houses, who are credited with acting for a London financial syndicate, and it would, no doubt, be an advantage for them, if they knew precisely how they stood in respect of the number of "split" warrants. It does appear just now as if another speculative corner was designed. Properly worked, it might prove successful for those concerned; but it could not be otherwise than demoralizing for legitimate trade, which can ill bear these gambling manœuvres. Extreme measures in any direction seriously disorganize trade, and lend strong force to the demand that has found expression in the bill now before the House of Commons for the suppression of illegitimate dealing in pig iron warrants. Judged of by the imports, Cleveland iron continues to make headway with Scotch consumers. The malleable iron makers of Coatbridge are mixing Cleveland iron with hematite, and the fusion is answering the requirements that formerly were only met by Scotch No. 4, in which a large trade was doing before the dispute. Down to this writing 23,264 tons of Cleveland iron were shipped this month from Middlesbrough to Grangemouth, the quantity in the first fortnight of December, 1889, only amounting to 6 918.—[London Economist.

Deficient Working of Machinery.

To locate the deficient working of machinery, with numerous points of friction, causes often both annoyance and waste of time, owing to the surrounding noise interfering with the observation of the sound to be insulated. The *Revue Industrielle* mentions as an effective and exceedingly simple means of overcoming this difficulty the use of a rubber tube about a metre long, one end of which is placed in the ear, and the other passed over the suspected spots. The vibrations from all other parts than the one covered being excluded, it is an easy matter to locate jarring noise, and, when found, to observe the intensity and periodicity with which it occurs.

Sample Free Trade Tinplate Rumor.

It is asserted in some quarters that the tinplate clause in the McKinley bill will be canceled before the date (July 1st) when it is to come into operation; or that it will be repealed immediately afterwards. The Democratic party cannot revoke the acts of the present government for some time to come, but the present Republican government can at any time repeal their own acts; and it is said that they will so deal with the tinplate clause at the earliest opportunity. Probably this rumor has led to an easier market for tinplates.—[London Iron and Steel Trades Journal.

IT is stated that ribbed boiler tubes are coming into favor. The ribs increase the heat absorbing surface of the tube, and consequently cause a higher temperature in the surrounding water.

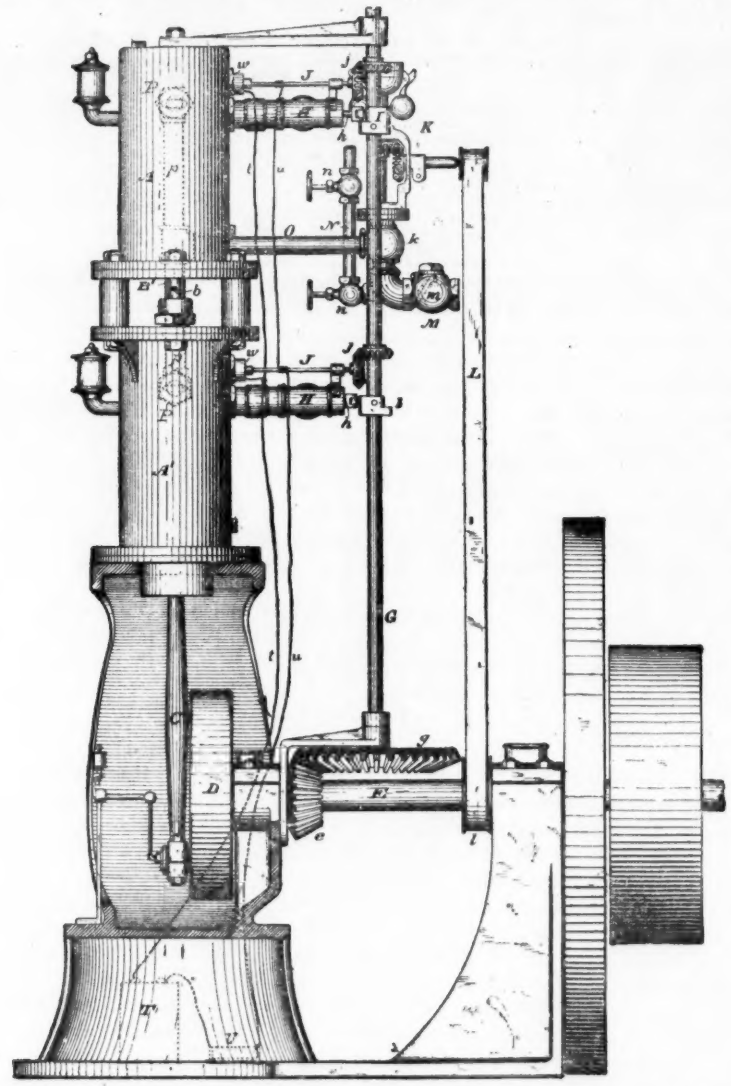
There were about 11,000 failures in business last year, so reports Dunn & Co., and the liabilities are shown to be about $189 000,000, which is $41,000,000 over last year. These are the largest liabilities since 1884.

A NEW GAS ELECTRIC ENGINE.

For many years power users have been demanding a more compact and economical motor or power producer than the steam engine and boiler; a motor that would at all times be ready for instant use, that would be free from danger of fire or explosion, and so automatically governed as not to require the service of an engineer or other skilled attendant. Mr. John B. Hicks, the well known inventor and manufacturer of steam engines, having his attention directed to this subject, investigated it, and was surprised to find a device so well and favorably known in such crude form. He has since then devoted his thoughts and energies to the subject, and now offers to the public, as a result of his labors, a highly perfected gas engine, possessing many advantages that at once place it in the very foremost rank of this type of machines.

In the Hicks gas engine, two cylinders set in line are employed to work alternately, their pistons being on one piston rod, to which an effective impulse is imparted for every revolution of the crank, doubling the power of the engine while adding only the weight of one cylinder and piston, (a very small percentage of the whole weight of the engine). By thus doubling the number of effective strokes of the piston a very much lighter balance wheel may be used with good results. The firing of the charge is done by electric sparks at the proper moment, produced by apparatus so simple that it cannot get out of order. This obviates the necessity for maintaining a constant jet of flame in the engine and the employment of apparatus to control it.

The two cylinders A, A, of the engine are arranged in tandem order, with one piston rod B, which passes into them and carries the two pistons. The



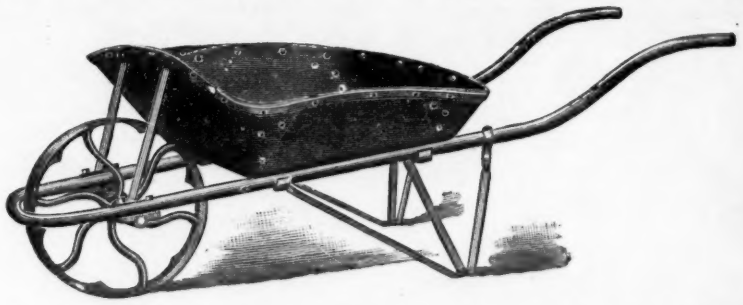
pitman C, connects the lower end of the piston rod to the crank plate D, on the main shaft E, mounted in bearings on the frame and bed plate. Gas is supplied to the engine from the pipe N, which connects to the air supply pipe M, the explosive compound or mixture of air and gas being formed below the valve chamber *k*, of the governor K, which controls the amount of the compound admitted to the cylinders. The air pipe is provided with an automatic wing check valve *m*, which prevents escape or back flow, and the gas pipe has two globe valves, one of which is set to gauge the quantity of gas to the requirements of the best explosive mixture, the other to cut off the flow when the engine is to stop. The explosive compound passes to the cylinders through the pipes O, a branch *p* of which leading to each cylinder, is provided with an automatic wing check valve *p*. The products of combustion or gases expanded by the explosions are exhausted from the cylinders through the valves H, which are seated against pressure from within the cylinder and held to their seats by light springs. After an explosion the expanding gases force the piston down and the valve H firmly onto its seat, but when the piston returns on its up stroke, the valve is pushed off its seat and opened to admit the escape of the burnt gases from the cylinder by a cam I, on the revolving shaft G, acting on the head *h*, of the valve stem. This valve shaft G, is driven from the main shaft E, by bevel gears *e*, *j*, proportioned to reduce its speed to one-half that of the main shaft, so that the escape valves H, are opened only for each alternate up stroke of the pistons. The charges of explosive compound above the pistons are fired by means of electric sparks, as follows: From a battery T, and coil U, or other source of electric power, extends a wire having branches which connect to contact points inside of each cylinder at its upper end, the points being properly insulated from the surrounding metal where it passes through the cylinder shell. Shafts *j*, also connected by the wires *u*, to the battery, project into the upper end of each cylinder through suitable stuffing boxes, and are provided at their inner ends with toes or wipers, which, at each revolution of the shafts, strike the contact points and cause electric sparks that fire the charges of explosive compound. These shafts are driven by the valve shaft G, through bevel gears *j*. The governor is driven from the main shaft E, by a belt L, running off the pully *l*, on the shaft. The piston rod is tubular and is provided with a hole *b*, through which oil is admitted to the cross-head pin of the pitman connection.

The operation of the engine is as follows: The gas throttle valve being opened, turn the fly wheel by hand once or twice and the engine will start into full operation. At the first downward movement of the piston the explosive compound will be drawn into both cylinders through the valves *p*, which then close and prevent its flowing back into the pipe as the pistons make their up stroke. During this up stroke one of the valves H, say the lower one, will be opened and the compound allowed to escape from the lower cylinder, while the compound in the upper cylinder is being compressed in the upper end of the cylinder. When the crank D, has passed its upper center, the electric spark explodes the charge in the upper cylinder, and the expanding air and gases drive the piston down rapidly and start the engine. When the piston has completed its downward movement, and starts upward, the upper escape valve H is opened and the gases in the cylinder allowed to escape. On its next downward movement, the piston again draws in a fresh charge of the compound which is compressed and exploded as before. When the pistons are descending under the impulse of the explosion in the upper cylinder, the lower cylinder is drawing in its charge of the compound to be compressed and exploded, while the upper cylinder is being cleared of the burnt gases and recharged, the two cylinders thus working alternately.

This engine is specially adapted for running street cars and electric light plants, and the company is prepared to make figures of a most favorable nature. For further particulars, address the Hicks Engine Co., 204 Superior street, Cleveland, O.

A NEW TUBULAR WHEELBARROW.

The accompanying illustration represents a tubular wheelbarrow, manufactured by the Cleveland Wheelbarrow & Truck Co., of Cleveland, O, known as their style A No. 1. The principle points in this barrow are its durability and ease in handling. The tray is made of one sheet of steel, bent to shape, and is fastened to handles by clamps riveted to tray, thereby doing away with bolts and nuts, which are always liable to jar off. The legs are so constructed that they form a perfect brace for handles, as can be seen by cut. The handles are of one-inch extra heavy pipe, bent in one continuous piece, so as to form a



guard for wheel, and also act as rest in the forward or side dumping of barrow. Owing to the peculiar shape of tray, the weight is well distributed over wheel. The wheel used in these barrows is a 17-inch malleable iron wheel, 1¾ inches tread, which fills one of the greatest wants in a wheelbarrow. These barrows are made in two sizes—No. 1, capacity, four cubic feet; No. 2, capacity, six cubic feet—and are largely used in foundries, bolt works and for all general purposes. The large sale of these barrows proves that they are rapidly taking the place of other makes. For further information and catalogue, address the manufacturers.

Wright's improved malleable iron wheelbarrow wheel is said to be the best wheel on the market for strength, durability and economy. 1st. There is no tire to break, as the solid rim forms the tire. 2nd. No spokes to get loose or break, owing to their peculiar shape. 3rd. It will bear a twice

heavier load than any wheel of equal weight. 4th. It is applicable to any barrow. 5th. When the journals are worn, the axle can be replaced at a trifling cost. These wheels are furnished by the Cleveland Wheelbarrow & Truck Co. with all their barrows.

PROFESSOR CARROLL says there are in Massachusetts alone 20,000 men in enforced idleness.

INDUSTRIAL SUMMARY.

New Enterprises:—

The new manufacturing plant of the Michigan Railway Supply Co., at Detroit, Mich., is nearly completed. The main building is 75x300 feet

The A. T. George Spring Motor Co. corporation formed to manufacture spring motors for street cars, of Kansas City, Kas., and Kansas City, Mo.

It is said that a company has been organized with a capital stock of $5,000,000, of which $500,000 is paid in, to erect a large iron and steel plant, at Denver, Col.

J. H. Huiett, L. D. Cullum, N. A. Bates and others have incorporated at Batesburg, S. C., the Batesburg Manufacturing Co., with a capital stock of $5,000.

The Steel Sink, Range, Boiler & Stamping Co., of Ontario, has been incorporated at Toronto, Can., with a capital stock of $50,000, for the purpose indicated by the name.

The Hogan Refrigerator Car Co., of Chicago, has been incorporated, for the manufacture of refrigerator cars; incorporators, E. J. Johnson, Annetta Woodward and H. R Pearson.

The Quebec Machine & Foundry Co., with headquarters at the city of Quebec, Can., will be incorporated with a capital stock of $30,000, to carry on the business of iron founders, machinists and general workers in iron.

The Parkersburg Hardware & Manufacturing Co. has been incorporated by Hon. C. B. Smith and others. It proposes to do a general hardware and manufacturing business at Parkersburgh, W. Va.

The Abutment Gate Co., of Chicago, has been incorporated, for the manufacture of safety gates and other improvements for bridges; capital stock, $300,000: incorporators, E. Leech, H. S. Williams and H. H. Ware.

The Drexel Car Coupler Co., of Chicago, has been incorporated, for the manufacture and sale of car couplers and railway appliances; capital stock, $600,000; incorporators, William A. Alexander, A. C. McCord and D. W. McCord.

A new interest is starting up in Ottawa, Can. The old Baldwin foundry, having lain idle for some months, has recently been acquired by Messrs. George Roe and Robert Graham, who will run it under the style of the Baldwin Iron Works.

New repair shops are being erected at Nicetown, Pa., by the Philadelphia & Reading, to take the place of the old shops at Third and Berks streets in Philadelphia. The new building will be 307x176 feet with an extension 25x36 feet; construction has begun.

The Gennett Air Brake Co. has been incorporated, with headquarters at Chicago, Ill., to manufacture air-brakes. The authorized capital stock is $800,000, and the incorporators are: David Wallach, Phillip Opper, Isaac Neuberger and Moses L. Rothchild.

The American Railway Co. has been organized at Denver, Col., to manufacture an improved sanitary stock car. The incorporators are Messrs. Vidler & Pierce, of Denver, who own all the patents, and John C. Avery, J. H. Crandall, B. Plumb and George B. Pullman.

Prominent capitalists of Milwaukee and the East are reported to have purchased a large tract of land near Milwaukee, Wis., upon which it is proposed to erect large car works, to give employment to 1,000 men. The proprietors of the Milwaukee Car Wheel Works are said to be interested. Work on the buildings is to begin soon.

Additions, Enlargements, Removals, etc.:—

The Gogebic Boiler Works, at Daluth, Minn., will soon double their capacity.

The Roanoke (Va.) Machine Works will probably rebuild its $25,000 blacksmith shop.

The Chattanooga (Tenn.) Car & Foundry Co. is rebuilding its foundry, which was lately burned.

It is stated that a St. Paul syndicate has purchased, for $300,000, the stove works of Redway & Barton, in Cincinnati, O., and will remove the plant to St. Paul, Va.

The Totten & Hogg Iron & Steel Foundry Co. are making a number of important additions to their works, corner Twenty-fourth and Railroad streets, Pittsburgh, Pa.

The Crucible Iron & Steel Works, East St. Louis, Ill., will nearly double their capacity by the erection of a new foundry, 100x64 feet. The improvements will cost $100,000.

The Triple Wire Nail Machine Co., lately reported as incorporated, to erect a Hastings wire nail factory in Parkersburg, will, it is stated, erect another factory in Huntington, W. Va.

The Ryan-McDonald Manufacturing Co., of Waterloo, N. Y., are to remove their machine works to Curtis Bay, Md., where a company with $100,000 capital stock will be incorporated, and where a building 350x70 feet will be erected.

Messrs. Brown & Co., of Pittsburgh, Pa., on the 6th inst. started their new three-high muck mill, which has been put in during the holidays. The mill is of most modern design, and, with the new puddling furnaces recently built, will make a considerable increase in the capacity of the works. The Lewis Foundry & Machine Co., of Pittsburgh, built the new mill.

Cox & Prentiss, doing business as the Cleveland Twist Drill Co., has purchased of J S. Ingersoll & Co. a piece of land, 100x331 feet in dimensions, located at the corner of Lake and Kirtland streets, opposite their present plant, for $19,000. The purchasers also assume a mortgage upon the property for $10,000, making the total purchase $29,000. The property is at present occupied by the Ingersoll Milling Machine Co.

General Industrial Notes:—

Lambert Bros., of Ironton, O., recently cast a 10,000-pound roll for the Ætna Iron & Steel Co., of Bridgeport, O. This is one of the largest castings ever made in the vicinity of Ironton.

Woodward's Foundry & Machine Works, Meridian, Miss., has been destroyed by fire.

Aurora furnace of the Schall, Steacy & Denny Co., Wrightsville, Pa., has been in blast continuously for four years.

The Pittsburgh (Pa) Portable Forge Co. recently organized in Pittsburgh, have commenced the erection of their plant on Smallman street, in that city. In addition to forges they will manufacture railings, gratings and steel barrows.

Messrs. A. J. Sweeney & Son, of Wheeling, W. Va., have abandoned their plan for building a wire nail factory in Council Bluffs, Ia., as a result of a factional fight in that city over the location of the plant. The firm has received a number of good offers from several other cities, but have not as yet decided on a location.

William Tod & Co., Youngstown, O., received an order last week from the Cleveland Rolling Mill Co., for a pair of blooming mill engines. These engines will be fitted with hydraulic reversing gear, and have cylinders 34 inches in diameter and of 48 inch stroke. They will weigh about 120 tons, and develop 1,600 horse-power.

Losses by Fire in 1890.

Comparison shows that the losses by fire in the United States and Canada for the year 1890 amounted to $106,998,345, as compared with $131,949,000 in the year 1889, a gratifying showing in favor of last year. The New York *Commercial Bulletin* published a comparative table showing the fire loss by months for 1889 and 1890—

	1889.	1890.
January	$ 6,898,700	$ 9,179 300
February	12,803,000	7,347,025
March	10 912,000	8,466,300
April	15 937,000	8,285,520
May	9 915.300	8 838 100
June	7,755,000	5,655. 00
July	1 .020.500	14.723.520
August	11,153,850	9,009,100
September	9.715.900	6,943, 00
October	8,366,600	7,279,500
November	20,081,?00	8,351,300
December	7,304,800	12,880,020
Total	$131,946,250	$106,998,345

The aggregate loss last year was smaller than for a long while, that for 1888 having amounted to $123,000,000; for 1887 to $129,000,000, and for 1886 to $116,600,000.

As to the outlook, the journal quoted says, what is true enough, that to those engaged in underwriting, especially those who manage fire insurance companies, the coming year is a matter of grave thought blended probably with some anxiety. "The most intelligent and experienced underwriter must realize that the chances of profit are at best problematical, and that mingled with this doubt is the certainty that whatever of good luck may be in store, such good fortune must be supplemented by the most diligent, skillful and intelligent handling of the business. All engaged in it agree that competition is exceedingly close, and that there is no margin in prevailing rates for incompetence or negligence."

Some people think that stiff rates and tariff agreements are the great essential for successful fire underwriting. But it is equally true that in addition to rates, practices, forms of policies and other matters, which, overlooked, may in effect cut the rates in two, are also important.

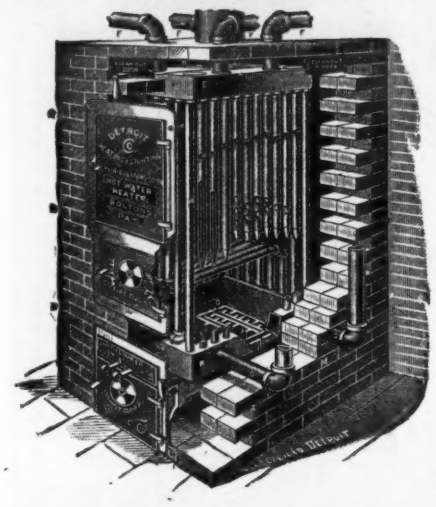
Rail Rolling at the Krupp Iron Works, Essen.

The name of Krupp is familiar to all far beyond the boundaries of Germany, or even of Europe, and therefore we feel sure that any reference to his works, or the appliances used therein, will be of interest to our readers. Most of the Bessemer steel made here is used in the manufacture of railroad rails. It is cast in blocks which contain sufficient material for two or three rails, according to the desired weight of the rails. These blocks, while they are still red hot, are carried to the preparatory rolling mills by horses, which have been trained to work in the midst of this fire and noise. Here they are heated, or rather kept hot, in special furnaces, and are rolled into longer blocks having a square cross section. After being thus prepared they are taken to the rail rolling mills with all the appurtenances, which stand together in one large room. The blocks which come from the preparatory mills are heated again, and then passed between the rollers, of which there are three placed one above the other, so that the rails are rolled during the backward as well as the forward motion, without requiring a change in the direction of rotation of the rollers. The rails have to pass back and forth between the rollers 13 or 14 times, and each time that they come from the rollers they are caught by the workmen on the short, bent ends of long levers which run on rollers on movable carriers. Each time the rail passes from between the rollers it is longer, and its cross section narrower, than after the former rolling, until it finally stretches itself out like a gigantic fiery snake. It is then taken to a circular saw, which cuts through the glowing metal as easily as a wood saw in a carpenter's shop cuts through a piece of wood, dividing the long bar into two or three rails. The cold rail is now put under presses, by means of which skillful workmen remove even the slightest irregularities. The final operations consist of boring the holes, evening the end surfaces, etc.

The Needle Industry in France.

The municipal council of Saint-Omer, in the north of France, will next year celebrate the 400th anniversary of the foundation of the first needle manufactory in France by Christopher Greening, an Englishman. The process of manufacture was greatly improved by one of Greening's successors, a Frenchman named Jean Gruez, who made a large fortune; and the reputation of Saint-Omer's needles spread even abroad, surviving in England until the last century. The needle industry in France is at present in a decaying condition, all the finer sorts of needles sold in France being made in England.

BOLTON



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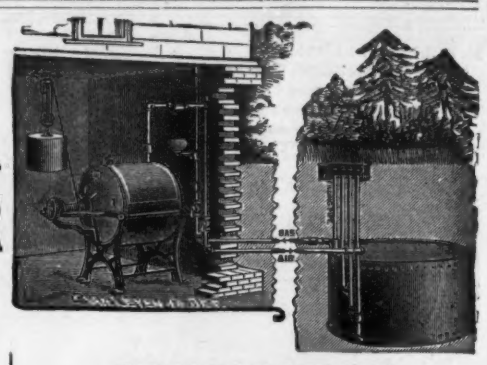

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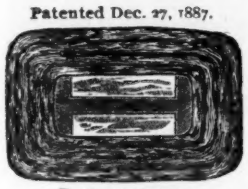

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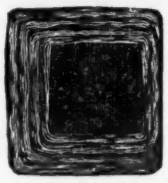

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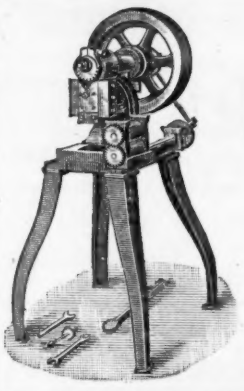

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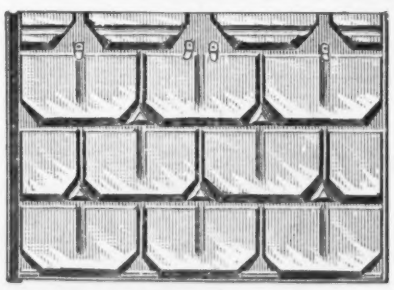

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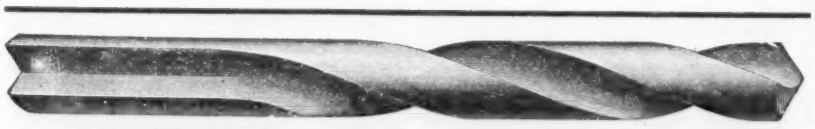

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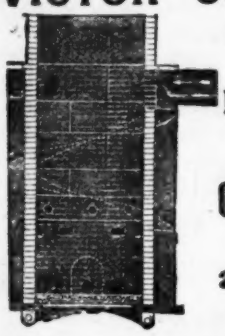

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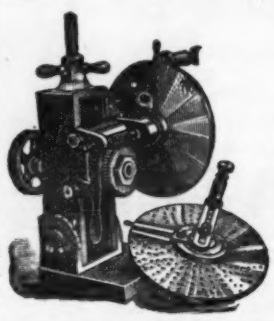

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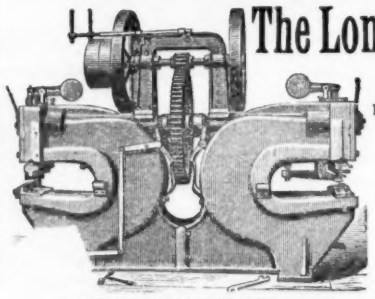

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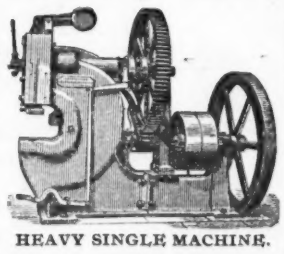

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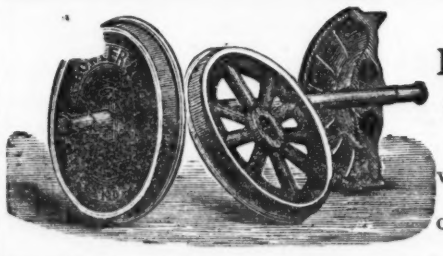

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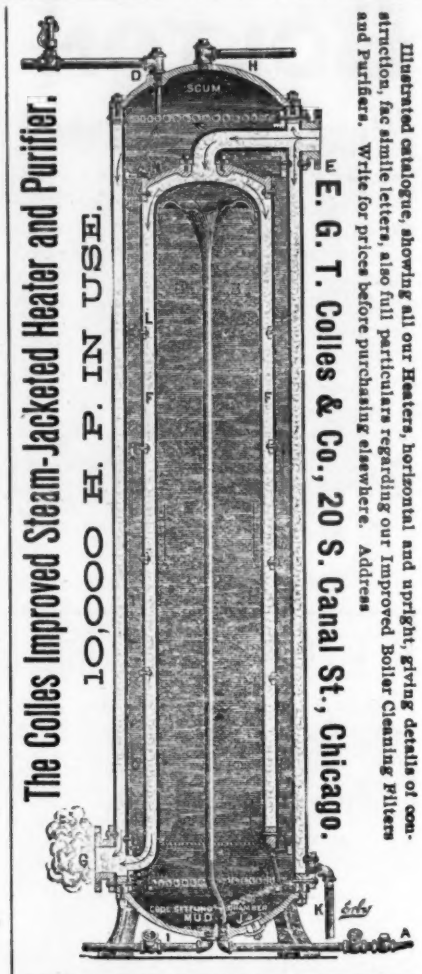

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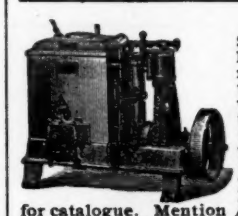

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CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1 foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 50@16 50; Southern Coke No. 3 Foundry, $15 00@16 00; Southern Coke No 1, Softeners, $15 50@16 50; Southern Coke No. 2, Softeners, $14 75@15 50; Ohio Silveries No. 1, $18 00@18 75; Ohio Silveries No. 2, $17 00@ 17 75; Ohio Strong Softeners No. 1, $18 25@19 50; Ohio Strong Softeners No. 2, $17 50@18 75; Lake Superior Charcoal Nos. 1 to 6, $19 00@20 00; Tennessee Charcoal No. 1, $19 00@20 00; Tennessee Charcoal No. 2, $18 00@19 00; Southern Standard Car Wheel, $22 00@24 50; Tennessee Standard Car Wheel, $19 50@20 50

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $14 50@15 00; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $17 00@17 50; Tennessee Charcoal, No. 1 foundry, $ 6 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 50@12 75; Standard Southern Coke, mottled, $12 25@12 50; Cold Short Southern Coke, grey forge, $12 50@12 75; Strong Ohio Neutral Coke, grey forge, $14 50@15 00. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $20 00@20 50; Tennessee Car Wheel, $18 50@19 50; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 25@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 25@00 00; Ohio Softener No. 1, $17 25@00 00; Ohio Softener No. 2, $16 25@ 00 00; Jackson Co. Silveries, $18 00@19 00; Lake Superior Charcoal, $20 00@00 00; Tennessee Charcoal, $19 50@00 00; Southern Softener No. 1, $16 50@00 00; Southern Softener No. 2, $15 75@00 00; Southern Strong No. 1 Foundry, $17 00@00 00; Southern Strong No. 2 Foundry, $16 50@00 00; Alabama Car Wheel, $23 00@24 00; Hanging Rock Charcoal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 75@14 00; Southern coke No. 3, $13 25@13 50; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No. 2, $16 00@16 50; Missouri charcoal, No. 1, $17 50@18 00; Missouri charcoal No. 2, $17 00@17 50. FORGE—Neutral coke, $12 50@13 00; Cold short, $12 50@13 00; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $21 00@22 00; Southern (other brands), $17 50@18 00; Lake Superior, $21 50@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@16 00; Southern Coke No. 2, $14 50@15 00; Southern Coke No. 3, $14 00@14 50; Southern Grey Forge, $13 50@14 00; Southern Charcoal No. 1, $17 50@18 00; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $21 00@21 50; Southern, $19 00@22 00. CONNELLSVILLE COKE—East St. Louis, $5 50; St. Louis, $5 55.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 50@20 00; Lake Superior (coke) Bessemer, $18 50@18 75; Katahdin (Maine Bessemer), $23 50@24 00; Lake Superior Coke, Foundry, all ore, $18 00@19 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 25@18 75; Southern No. 1, $16 00@16 50; Southern Gray Forge, $14 25@14 75; Jackson County (Ohio) Silvery, $18 50@19 00; Old Car Wheel, $00 00@00 00. Connellsville Coke, $4.65.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 00@14 50; Southern Coke No. 2 Foundry $13 50@14 00; Southern Coke No. 3 Foundry $13 00@13 50; Grey Forge, $12 50@13 00; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $17 00@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 00@17 25; No. 2 Foundry, $16 00@16 25; Grey Forge, $15 00@15 25; White and Mottled, $14 00@14 25; Warm Blast Charcoal, $18 00@21 00; Cold Blast Charcoal $23 00@27 00; Bessemer, $17 00@17 50.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1½ to 6 by 1½ to 2 inch	2 20
1½ & 1¾ by ⅜ to ¼ inch	1 90
1 & 1¼ by ⅜ to ¼ inch	2 00
⅛, ¼ and ⅜ by ⅜ to ½ inch	2 20

Round and Square.

1 to 1⅞ inch	1 80
2 to 2¾ inch	2 00
2¾ to 3¼ inch	2 0
3⅜ to 4 inch	2 80
4⅛ to 4¾ inch	3 50
4¾ to 5 inch	3 50

Oval.

⅜ to 1¼ inch	2 20
½ to ¾ inch	2 40
⅞	2 60
1	3 00

Half Oval and Half Round.

1⅛ to 3 inch	2 90
⅜ to 1¼ inch	3 10
½ to ¾ inch	3 10
⅞	3 0
1	4 80

Heavy Band.

⅛ to 6 by ¼ and 5-16 inch	2 00
to 1¾ by ¼ and 5-16 inch	2 0
1¼ to ⅜ by ½ and 5-16 inch	3 30
1¼ to ¾ by ½ and 10 inch	3 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 60
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 [illegible]
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1¼ to 6 by ¼ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ¼ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅜ and 13-16 by ¼ to 3-16 in	2 70
⅜ and 1 3-16 by Nos. 11 and 12	2 80
¼ and 11-16 by ¼ to 3-16 in	3 00
¼ and 11-16 by Nos. 11 and 12	3 10
⅛ and 9-16 by ¼ to 3-16 in.	3 [illegible]
⅛ and 9-16 by Nos. 11 and 12	3 40
⅛ by ¼ to 3-16 in	3 60
⅛ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	2 80
⅜ inch, " " " 13 and 14	3 00
¼ inch, " " " 11 and 12	3 10
¼ inch, " " " 13 and 14	3 30

Sheet Iron.

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 90
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, " "	3 [illegible]
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavie .

Tank	2 75
Shell	3 15
Flange	3 [illegible]
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	½c lb extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2⅜ to 3 in	10¾
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10¾
⅝ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. lbs
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
Spring	"	3 25
Sleigh Shoe	"	2 75
Toe Calk	"	3 00
Cutter Shoes, tapered and burr.	"	3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅝, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	Net Tons
No. 1 R. R. wrought scrap	$19 00
No. 1 wrought scrap	17 00
No. 1 Machine cast scrap	12 00
Iron axles	24 00
Axle turnings	13 50
Wrought turning (free from cast)	12 00
Cast borings	8 00
Uncut wrought iron boilers	11 00
Steel boiler plates	17 00
Grate Bars	8 00
Pipes and flues (Clean)	13 50
Tank iron	13 50
Hoop and band iron	10 00
Sheet iron	9 50
Wrought drillings	11 00
Malleable iron	10 00

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	12 00

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MANUFACTURERS OF
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Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

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Specially adapted for making strong, tough iron, and for carrying large proportions of mill cinder and cold short ores.

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—AND—
- - PIG IRON
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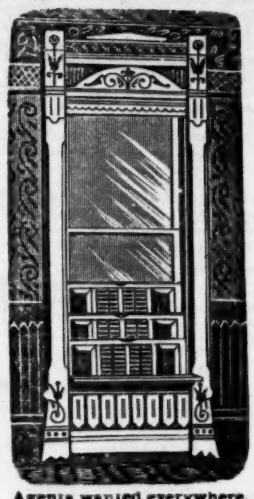
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MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single, ...dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

S. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¾@10¾

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3¾

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to No. 54 46 gr.	150. gr.	F.	FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 40
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3¼
Hexagon	15⅝	11⅜	8⅛	6	5½	5½	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ¼c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots$2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb D10@11
Russia Packing " .....₩ lb D14
Italian Packing " .....₩ lb D13@14
Plumbago Piston.....₩ lb D40
Morrison's " .....₩ lb D50
Square Flax " .....₩ lb D50
Sheet Rubber.....₩ lb D12&24
Excelsior Rubber.....₩ lb D48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb D15¾
Sisal, ¼ inch and over .....₩ lb D13¾

Sand Paper.

B. A. & Co.....dis45@50
H. H. Barton's.....dis40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@ 5
" Band.....40
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 2
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&1
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 25c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)		11¼c
3-Ply " 1lb Balls		12@12½c
3-Ply " 1⅛ lb Balls		11@11½c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30

Wire.

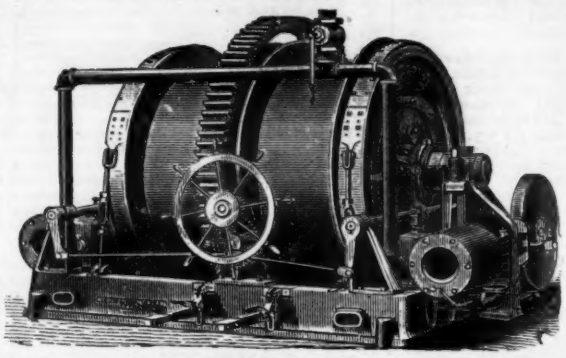
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18..dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 3

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

Webster, Camp & Lane Machine Co.



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Endless or Tail Rope Systems.)

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IRON CASTINGS.

DAILY MELTING CAPACITY 75 TONS—SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.

DUPLICATE WORK A SPECIALTY

STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position, or for any service whatever.

60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.

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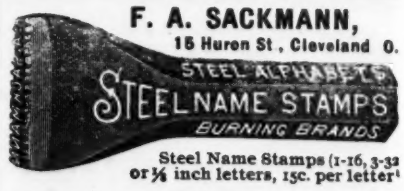

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Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ℔ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ℔ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....℔ doz $8 00
Others.....℔ doz $7 00
Full polished.....℔ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&10&5
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
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Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
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Roofing Pitch, ℔ gal.....09

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Revised List.

Trace, 6⅝-10-2.....℔ pair 1.03
Trace, 6⅝-10-3.....℔ pair .92 } .....50&10
Trace, 7-10-2.....℔ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....℔ lb 5¾@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

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Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
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Fire 12 qt.....	5 00	.....	.....
Sugar.....	6 00	6 50	.....
Horse.....	.....	5 00	.....
Buggy.....	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.....	6 50	7 50	8 50
Pans, slop, 5 and 5X 14 qt.....	8 00	9 00	10 00
Basins, wash—			
10½ inch.....	2 00	2 25	.....
12 inch.....	2 25	2 75	3 25
13½ inch.....	2 75	3 25	3 75
15 inch.....	3 25	3 75	4 25
Bowls, fruit.....	.....	2 50	.....
Servers, 12 in.....	.....	2 25	.....
Baskets, waste paper, 13 in.....	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch.....	4 00	4 50	5 00
10 and 11½ inch.....	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White decorated.

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Nail and Spike.....dis 50&10&5
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"Bee".....℔ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 60&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....3 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ℔ lb..	23	24	25	26	28	dis 40
Putnam, ℔ lb..	18	19	20	21	23	dis 15

Essex.....dis 25&10

Horse Shoes.

Burden, at factory.....℔ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....℔ keg $4 00
Mule Shoes, at factory.....℔ keg $5 00

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Carriage, japanned.....℔ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
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Door Por. plated.....$2 00@2 25

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Door locks, knobs and latches.....dis 60&10
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Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....℔ gross $4.80

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Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

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Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

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Bishop's O K.....℔ doz $5 25
Bishop's Pioneer.....℔ doz $3 75
Bishop's American.....℔ doz $2 75

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Wostenholme & Butcher.....$10@24...dis 10
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Schuyler's.....℔ gross $15 00

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Hatch, Tea, No. 161.....℔ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

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New List, Oct. 19, 1890.

American iron carpet tacks all kinds.....dis 77½&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds.....dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77½&10
Tinned Swedes iron Upholsterers' tacks.....dis 77½&10
American iron cut tacks.....dis 77½&10
Copper tacks.....dis 4 &10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10
Finishing nails.....dis 60&10
Hungarian nails and miners' tacks...dis 60&10
Gimp and lace tacks.....dis 77½&10
" " " tinned.....dis 60&10
Trunk and clout nails.....dis 72½&10
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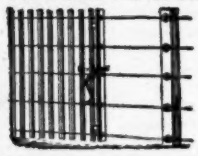

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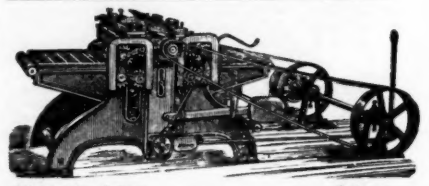

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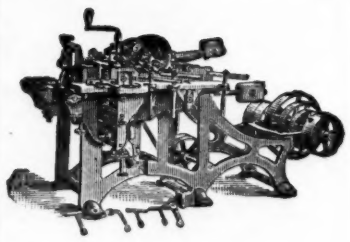

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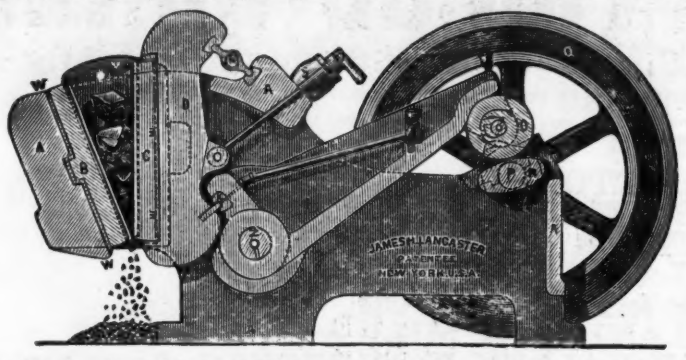

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Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

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(Standard Gauge.)

Depart for—
Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—
Zanesville and Coshocton—10:30 a. m.,6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6.30 p. m., 7:10 p. m.
Trains marked * run daily.

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	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	10 10 a m
Ravenna Accom.....	5 00 p m	8 25 a m

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FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Marietta Express.....	†11 15 a m	*2 15 p m
Bal'o. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

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	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus. Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
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No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express..	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 45 p m
No. 73, Leavitsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
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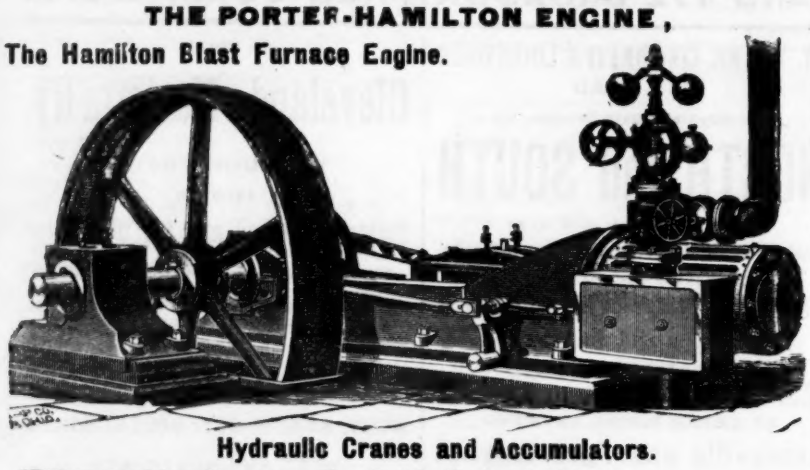

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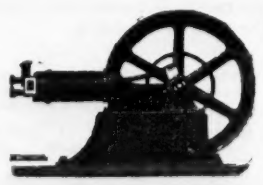

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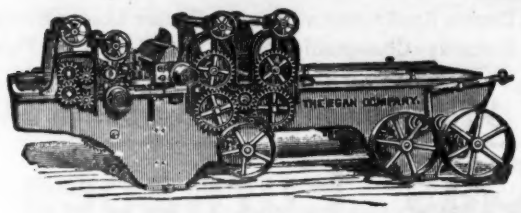

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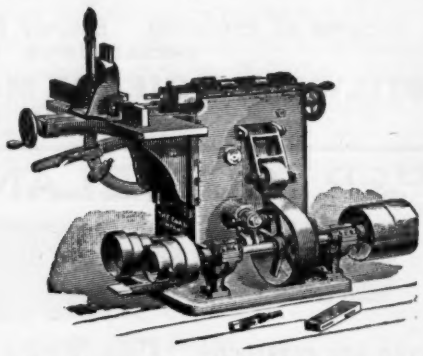

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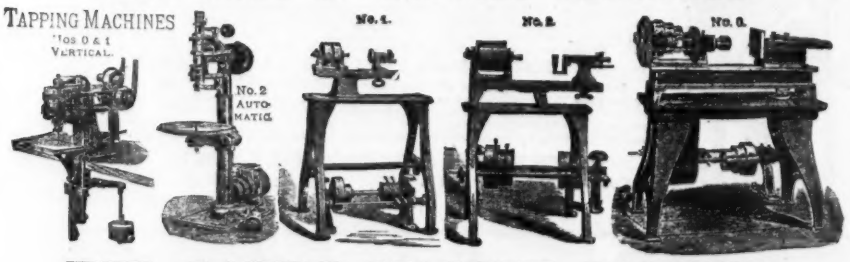

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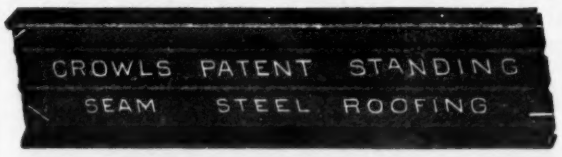

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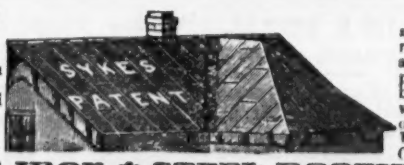

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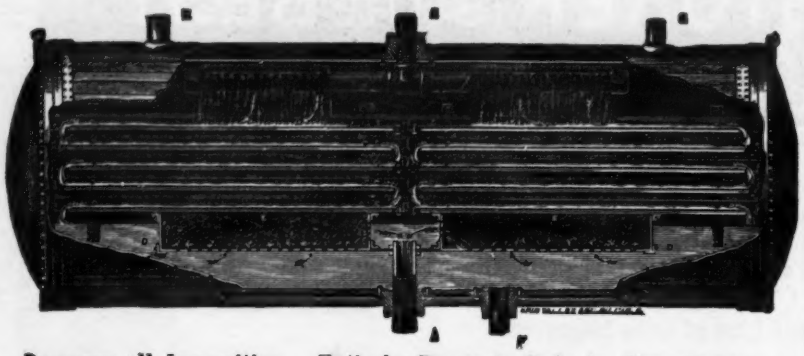

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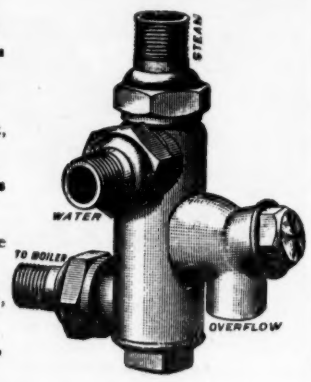

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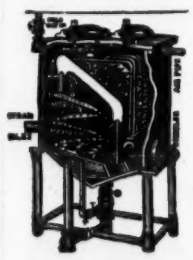

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